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DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

EDITED BY EDWARD LIVEING, B.A.

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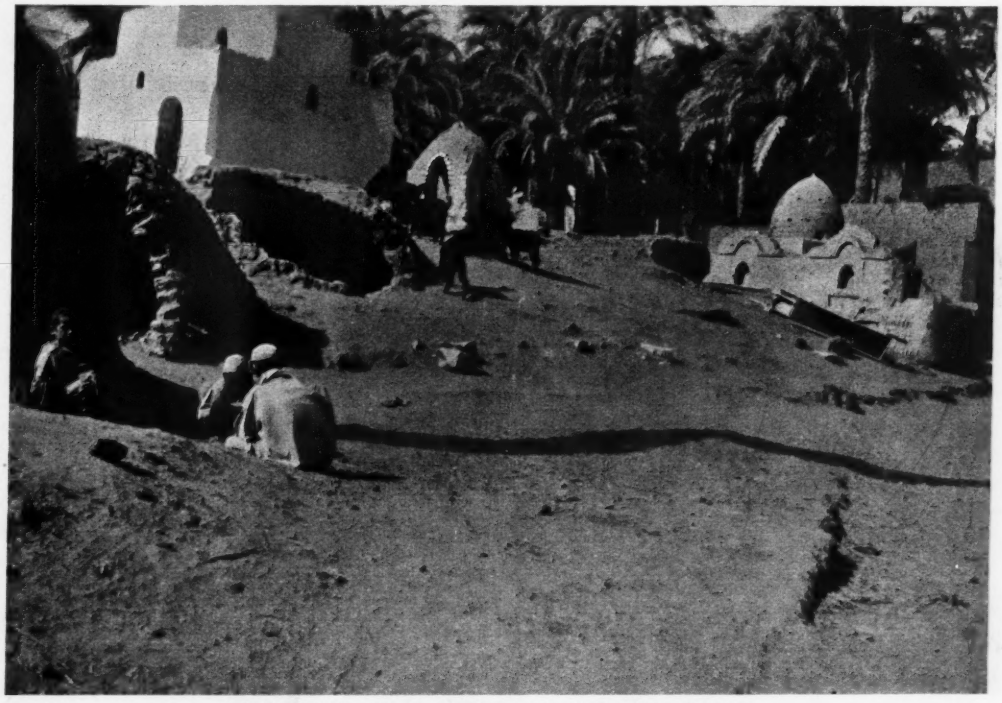

THE TOMB OF A SHEIKH IN MODERN EGYPT

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JOHN MURRAY, 50A ALBEMARLE STREET, LONDON, W.1.

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Editorial Notes

THIS month we are promised the excitement of a further penetration into Tutankhamon's tomb. So the winter and early spring will see a revival of interest in the life and civilisation of the ancient Egyptians. Prosperous city merchants will exchange remarks about the new "finds" over their port in the club; elderly dames will attire themselves in dresses "with a touch of the East about them"; there is certain to be a Tutankhamon Tango in honour of the "old boy," who did himself well a few thousand years ago, and for the benefit of the dancing youth of to-day. If one of Mr. Howard Carter's pet canaries dies during the exploration of the tomb, certain spiritualists will be confirmed in their belief that the shades of Tutankhamon have been enraged; and, in any event, the press will again be filled with outcries against the desecration of a human being's resting-place—however ancient it may be. Meanwhile the sellers of Oriental novelties will rejoice at their increased profits, and publishers will rub their hands pleasurably as they launch books about the ancient Egyptians on the expectant public and the public shows its appreciation in cash.

* * * * *

To persons with imagination these extraordinarily successful excavations in Upper Egypt, described graphically in a lantern lecture in London last September by Mr. Howard Carter himself, cannot fail to appeal with unusual intensity. Instead of a few fragmentary remains, the finds are so extensive, rich, and beautiful that, looking at photographs of them, one begins to summon up pictures of the teeming life in the Nile Valley of those bygone days. That life has altered little since Tutankhamon's time, despite a new religion and the advent of Western forms of government and officialdom. The Nile still flows through the Libyan Desert and supplies the irrigated stretches of vegetation on either side of it with fertile mud; and the sun continues to shine from blue skies throughout the year, with the exception of an exceedingly few rainy days. In city and country-side you encounter customs and scenes which you would have encountered had you visited Egypt in the days before the Exodus.

* * * * *

Professor Newberry at the September meeting of the British Association, speaking of the modern Egyptians, said that "in almost every circumstance of daily life we see the Old in the New. Most of the ceremonies from birth to burial are not Moslim, or Christian, or Roman, or Greek; they are ancient Egyptian." In several past numbers of DISCOVERY we have published articles by Miss Blackman on the ways and customs of modern Egyptians, and in this number we print an article by her on *Moslim Saints in Modern Egypt*, which amply bears out Professor Newberry's statement. So many field anthropologists are nowadays turning their attentions—and rightly so—to the study of savage races in the hope of rescuing their religions and social customs from oblivion ere the advent of the white man caused them to disappear, that in recent years the modern Egyptian has been comparatively little studied—indeed he has never been studied in anything like the way that some of the Central African tribes have been studied. Lane's book on the manners and customs of the Cairene Egyptian still remains as the standard work on modern Egyptian life, though it contains no account of the much more interesting *fellahīn*, or peasants. "A

rich harvest awaits any student," said Professor Newberry, " who, knowing the language, will settle and live throughout the year among the peasants in any village or town in the Lower Nile Valley or Delta."

* * * * *

Much interest was aroused by the report at the British Association's meeting that a domestic fowl which had laid a number of eggs, and was to all appearance a hen, had gradually become transformed into a cock. Details of a further study of this strange event are given—in highly technical language—by H. B. Fell in the first number of the new *British Journal of Experimental Biology*. It is in many ways a tragedy—for the presumptuous creature eventually fell into a drain and was drowned. It was a Buff Orpington, " an unremarkable hen," which had raised many of her own offspring. In June 1923 the gradual change which had been coming over it for six months or a year became complete—it looked like a cock with short legs and an unusual stance. It was mated with a hen, and two live chicks were hatched. After its untimely suicide, it was found to be suffering from tuberculosis—which in this instance was the prime cause of the change of sex through disease of the egg-bearing glands. Seven other fowls are described as showing intermediate stages in this change, without evidence of tubercular disease.

* * * * *

Domestic fowl have been known to manifest this disconcerting change of sex for many years; a case was reported by Shattock and Seligman in 1906, and for scientists the chief interest of these observations lies in the light they throw on the origin of sex. In the cases here considered the new glands grew from the membrane covering the egg-bearing glands, known as the peritoneum, and this new growth always started after the destruction by disease of the female glands, or after they had shrunk and ceased to function. No case is recorded of a cock becoming a hen, which would be, from the chicken-rearer's point of view, a far more desirable phenomenon. The change of plumage with change of sex is in accordance with many well-known observations on the transplantation of glands into animals of opposite sex; " secondary sexual characteristics " such as the antlers of certain deer and the manes of lions are due to the internal secretions of these glands. It is probable that such metamorphoses as that described by Dr. Crewe at the British Association meeting are not uncommon among domestic fowl, and it should add a fresh zest to the back-yard poultry-farmer to keep an expectant watch on his stock. But we cannot help being thankful that the seers of ancient Rome, who foretold the future from an examination of the entrails of fowl, never had to come to a definite conclusion from the spectacle of some such intermediate creature as these of the British Association. Or are we wrong?—do we remember a Roman disaster, foretold in the days of Livy by a hen which crowed like a cock?

* * * * *

Our notes in a recent number on the subject of vaccination have induced several correspondents who differ from us to inform us of their own views. They are far from complimentary. In one instance we are stated to have exceeded the wildest statements of the Yellow Press—we understand by that phrase, presumably, such journals as *The Times* and *The Lancet*, whose views on this subject may differ in expression but not in essence from our own. We have received a long series of statistics, and a repetition of several arguments as familiar to our readers as to us; some of them—such as the fact that in some instances vaccination is followed by serious effects to the vaccinated—are undoubtedly valid, but, if vaccination really does prevent wholesale deaths in epidemics, they are not an argument for less vaccination, but for more care in vaccination to prevent contamination of the scratch. Others—in particular a statement that the illness following vaccination is really allied to a peculiarly unpleasant disease other than smallpox—have not a particle of evidence to support them, and are to be compared with the ridiculous statement that the Pasteur treatment for hydrophobia does not cure, but in fact inflicts, the disease. We cannot give space, in a journal of this nature, to a general discussion on a rather trite subject. Those who differ from us must accept our attitude as a confession of faith rather than an attempt to establish a position or controvert the many arguments against vaccination which may be found in journals which are not " yellow."

ACROSS THE JORDAN

THROUGH the great North Arabian Desert, which separates Palestine from the plains of Mesopotamia, lay, for many centuries, one of the great trade routes of the world. In the days when the Caliphs were mighty in Baghdad, many rich caravans brought silks, spices, and precious stones from the East by this route; but the discovery of an alternative route via the Cape of Good Hope by Vasco da Gama in 1497 robbed it of its importance as a line of communication, and to-day it is one of those lost and unknown corners of the world where anything—and chiefly unpleasant things—may happen to the adventurer. In the middle of this desert is hidden the oasis of Jauf, and in the *Geographical Journal* for October 1923 H. St. J. B. Philby, C.I.E., describes his expedition thither on Ford cars. There are two main industries in that desert—the evaporation of brine, to procure salt, which is done on a small scale, and the slaying of neighbours, which is done on quite an ambitious scale. The story of the journey, in an atmosphere of suspicion and revolution, and the excellent photos of this strange and uninviting desert, remind us that, even in this late century, the spirit of the Arabian Nights is still, somewhere, an unpleasant but romantic reality.

Moslim Saints in Modern Egypt[1]

By Winifred S. Blackman

Oxford Research Student in Anthropology; in charge of the Percy Sladen Expedition to Egypt, 1922-3

A MARKED feature in the life of the modern Egyptians is the veneration which they show for holy men and women, to whom miraculous powers have been attributed either during their life-time or after their death. Such a holy person is given the title of *Sheikh* (fem. *Sheikha*). The word *sheikh*, as I explained in a former article contributed to DISCOVERY,[2] means literally an old man; it also signifies the head of a tribe, the leading man in a village, a learned man (i.e. one learned in the sacred writings), and a holy man or saint, living or dead. There are a certain number of these holy men who are venerated all over the country, the cults connected with them having become part of the popular religion. But, besides these greater personages, there are innumerable local saints, who, however, often draw their devotees from localities beyond the boundaries of their villages.

However great may be the veneration paid to a saint in his life-time, the honour he receives after his death is far greater. Among the Moslims it is the custom to erect over the grave of such a person a small white-washed building, crowned by a dome. In many cases a "servant" is also supplied, whose salary is paid out of an endowment in land or money augmented from the donations of those who visit the tomb. This man, or it may be a woman, is known as "the servant of the *sheikh*," and the office often descends from father to son. Besides the land and trees surrounding the tomb, the sacred precincts may include a well, in which case the water is supposed to be endowed with miraculous properties. Sometimes a heap of stones, or a tree or clump of trees, alone marks the last resting-place of a departed *sheikh*, but when there is a domed tomb, a tree or trees are nearly always associated with it. (Fig. 1.)

Every Moslim *sheikh* (at any rate most of those of any standing) has seven tombs, or other burial sites, associated with him. This does not mean that the body of the *sheikh* is actually buried in any one of these sites, though there are many cases when this is so. A dead *sheikh* may appear to some man in a dream, or even when he is awake, and tell him to build him a tomb on such and such a spot, sometimes personally conducting him thither. It may happen that the inhabitants of a village possessing a venerated *sheikh* have been guilty of misconduct, or have offended the holy man by neglecting to pay him the veneration he considers his due. In such a case, it is believed, the *sheikh* will appear to a man in a distant village and instruct him to build him another tomb. The new tomb often becomes more popular and is visited by a larger number of people than the older building. Thus a *sheikh* whose original tomb is in Lower Egypt may also be associated with a tomb or tombs far south in Upper Egypt.

Candles, or the money with which to buy them, form a favourite offering. Such lights are kept burning every night in some *sheikhs'* tombs; in others they are perhaps burnt on one night only in the week—usually a Friday. A number of votive offerings are generally found hanging on a cord or cords stretched across the interior of the building. The gifts display great variety, consisting of glass and bead bracelets, bunches of human hair, handkerchiefs, first-fruits of the corn-fields, and so on. Each one registers an answered prayer, for the people flock in crowds to these tombs on certain days of the week—usually Thursdays or Fridays—generally to make some special request, or with the object of being freed from some disease which they believe the *sheikh* can cure. A childless woman or persons possessed by *'afarīt* (spirits) will come to beg the *sheikh* to intercede for them. Indeed, the performances of certain rites at the tomb may in themselves effect a cure.

Having removed his or her shoes before entering the building, the visitor then walks from left to right round the catafalque erected beneath the dome, three, five, or seven times, reciting meanwhile special passages from the *Ḳuran*. These perambulations accomplished, the servant of the *sheikh* takes a broom, kept for this special purpose, and carefully brushes out all the footprints in the interior of the building.

Sick animals are also brought by their owners to a *sheikh's* tomb, round which they are driven seven times.

A Typical Sheikh's Tomb

In one of the provinces of Upper Egypt, on the lower desert, half-way between the cultivation and the limestone cliffs which form the edge of the upper desert, stands the domed tomb of the *Sheikh* Ḥasan 'Ali. It is surrounded by a low mud-brick wall, which encloses a few small trees, a well, and two or three graves, wherein relatives of the dead *sheikh* lie buried. Pots of *ṣobara* (aloes) also decorate the sacred spot, this plant being believed to bring happiness to the dead. The building is whitewashed and is decorated

[1] Most of the material used in the following article was collected by me in the course of my expedition in Egypt during the past winter and spring, the funds being provided out of a grant from the Trustees of the Percy Sladen Memorial Fund, and a supplementary grant from the Royal Society.

[2] Vol. iv, p. 11, footnote 2.

with line-drawings in red and blue, representing the pilgrimages to Mecca (see Fig. 2). The surrounding desert is covered with the graves of more ordinary folk. These are marked by heaps of sand into which are stuck branches of palm-trees, for palm-branches, like

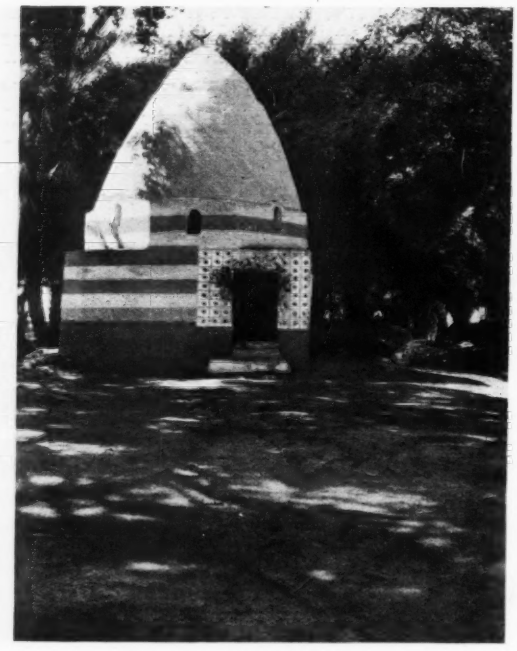

FIG. 1.—A *SHEIKH'S* TOMB.

the aloe-plants, are believed to be the means of conveying happiness to the dead who lie beneath.

The *Sheikh* Ḥasan 'Ali was only eighteen years old when he died, but from his earliest years he was noted for his piety. He was educated at a small school in his native village, and, as soon as he had learned to read, he spent all his leisure moments studying the *Ḳuran*. When he died he was buried in an ordinary grave in the lower desert among his dead fellow-villagers. However, one day, when old 'Ali (his father) was squatting on a bench (*maṣṭabeh*), with his head resting on his hand, his dead son appeared before him and caught hold of him by the wrist, saying, "I am very angry." His father said: "Why are you angry, my son?" The boy replied: "Because you have not built me a large tomb, and if you do not do so now, I will go away to another village." "Oh, my beloved son," said his father, "to-morrow morning I will begin to build a fine tomb for you." Young 'Ali held a paper in his hand, and he now presented this to his father, telling him that on it were written full directions for the building of the tomb, together with a specification of the exact spot where it was to be built, and also as to where would be found a well of water, the locality of which was hitherto unknown.

The tomb was built with all speed, the workmen following the instructions written on the paper presented to old 'Ali by his son. The well was sunk on the spot indicated, and the water from it is excellent. The father states most emphatically that he was wide awake when his son appeared to him. When I questioned old 'Ali as to what he had done with the paper, he told me that it had been lost by the workmen.

A small model of a boat is hung up in the *Sheikh* Ḥasan 'Ali's tomb, as in the tombs of most *sheikhs*. This is an ancient custom still adhered to, the boat being called "the ferry-boat."

A certain *Sheikh* Seyd was buried in a dome-shaped tomb near a large town in Middle Egypt. Though his burial-place was not far from the capital of the province, the locality was somewhat inaccessible. Moreover, he was displeased with the people who lived in the village adjacent to his tomb. The *sheikh* therefore appeared one night to a man who lived near to the capital of a neighbouring province and led him to a site in the cultivation, where he instructed him to build him a tomb, pointing out at the same time a spot where he would find a spring of water. Here he commanded the man to sink a well. The tomb was duly built, and it has become a popular resort for all those who seek the *sheikh's* aid, people flocking here in large crowds every Thursday. Though the newer building can boast the larger number of devotees, many still visit the original tomb.

Trying a Thief in a Saint's Well

The *Sheikh* Seyd's well, situated close to the newer building, serves another purpose besides that of supplying the faithful with water. If a man thinks that another has stolen money or anything else from him, he first takes the suspected thief, and washes him in a stream of water, probably in the Baḥr el-Yūsif. He then conducts him to the *Sheikh* Seyd's well, where he will seek the assistance of the "servant of the *sheikh*," who knows at once what is required in such a case and produces a thick rope, such as is used for water-wheels. He firmly knots it round the supposed thief, passing it under his armpits, and the wretched man is then lowered into the well. If he is guilty he simply disappears in the well, and when the servant pulls up the rope, no one is there! If, on the other hand, he is innocent, the servant pulls him up by the rope, which has remained fastened round his body, and releases him. No one would dream of suspecting him after this infallible proof of his innocence. In the event of his guilt being proved, his dead body will probably be found two or three days later in a stagnant pond of dirty water a long distance away from the well into which he had been

lowered. The officials are trying to put a stop to this practice, as so many dead bodies have been found from time to time in the foul water of this pond.

A Mad Sheikh

The *Sheikh* 'Abdu'l-Laṭīf lived in a small village in Fayūm Province, where some of his family still reside. An old man, the son of the *sheikh's* paternal uncle, is well known to me. The *Sheikh* 'Abdu'l-Laṭīf was, in his life-time, looked upon as a *wali*. Insanity is the usual qualification for this high standing among the Moslim saints of Egypt, persons thus afflicted being regarded as the favourites of God. The *sheikh* had a habit of entering the houses of the people at night, after the doors had been locked and while the evening meal was being cooked, for locked doors formed no barriers to the egress or ingress of this holy man. On entering he would immediately eat up all the food; meat, bread, and vegetables, no matter how large the quantity, would all be devoured on the spot. Any glass bottles that happened to be lying about might be included in this repast, for these he would bite up and swallow without drawing any blood. There was only one thing he feared, and that was water. If anyone threw a few drops of water at him, he would run away in terror, as fast as his legs could carry him. My informant, Hideib 'Abd-el-Shāfy, remembered him well, and he told me that on one occasion the *sheikh* entered his house after the entrance door had been securely locked, and ate up all the food, including the soup, prepared for the evening meal.

When the *sheikh* died, hundreds of people attended his funeral, and, being a very good man, he made his bearers walk quickly to the grave.[1] Above it has been erected the usual domed tomb which is situated near that of the venerated *Sheikh* Umbārak, for whom a *mūlid* is held once every year (see Fig. 3).[2] One year, on the occasion of this festival, a man climbed on to the outside of the tomb of the *Sheikh* 'Abdu'l-Laṭīf without first removing his shoes. Some of the people standing around remonstrated with him for this act of irreverance, but he replied: "Who is the *Sheikh* 'Abdu'l-Laṭīf? He is nobody!" and refused to climb down or to take off his shoes. However, when he wanted to climb down and join the festive crowds, he found that he could not move, and that, when he tried to do so, his limbs were rigid and his whole body paralysed. On seeing the plight of the wretched man, cries to the *sheikh* were immediately raised. People came with drums and tambourines, others sang and clapped their hands in rhythmic accompaniment to the music, till at last, after about two hours of such intercession, the man regained his power of locomotion, and so was able to move away.

Some time after this exhibition of his power, the *Sheikh* 'Abdu'l-Laṭīf appeared to a man in a village a few miles distant, telling him to build him a tomb there. The people of this village went in triumph to the *sheikh's* native place and exultantly told the inhabitants that their *sheikh* had now come to them.

The original tomb still exists, but it is in a dilapidated state and, no doubt, in course of time it will wholly disappear, unless something happens to revive the veneration formerly paid to the holy man in his native village. Meanwhile, the people of the village where 'Abdu'l-Laṭīf's later resting-place is built hold a *mūlid*, or festival, every year in honour of their acquired *sheikh*.

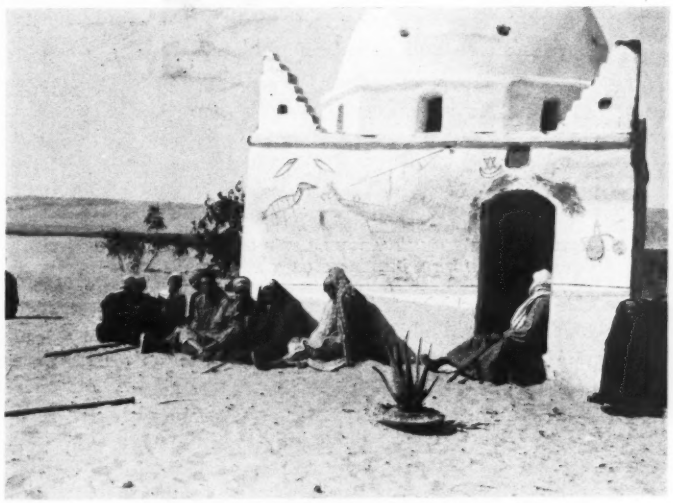

FIG. 2.—THE TOMB OF THE *SHEIKH* ḤASAN 'ALI.

During the *Sheikh* 'Abdu'l-Laṭīf's life-time he was visited on one occasion by the *Sheikh* Sulimān, who resided in a village some miles distant. Wherever he went the *Sheikh* Sulimān was always accompanied by his faithful servant. On the occasion of this visit the two *sheikhs* conversed together in an unknown language. This roused the curiosity of the *Sheikh* Sulimān's servant, who after the interview asked his master what they had been talking about. The *sheikh* told

[1] If a man or woman has led a good and religious life, when they die they will make their bearers walk quickly to the grave; but if they have led lives contrary to the rules of their religion, they make their bearers walk slowly, as they fear death and the grave, where they will be examined on the following night by the two angels *Nākir* and *Nakīr*.

[2] See my article *Festivals celebrating Local Saints in Modern Egypt*, in DISCOVERY, vol. iv, January 1923.

him that 'Abdu'l-Laṭīf had remonstrated with him for coming to his village and had bade him remain in his own neighbourhood. Doubtless jealousy was at the root of this ill-feeling. A few days later the servant noticed very early in the morning that his master's fingers were all burnt at the tips. He immediately questioned him as to the cause of this injury, and the *sheikh* told him that it was his custom to go every night to all the *sheikhs'* tombs in the neighbourhood and light candles for them, and that while he was engaged in this pious work his fingers got burnt.

The *Sheikh* Sulimān is now dead, but his piety is still remembered. He is buried in his native village, but six other tombs are erected to his memory in various parts of the country. Moreover, the inhabitants of his village hold a *mūlid* every year in his honour.

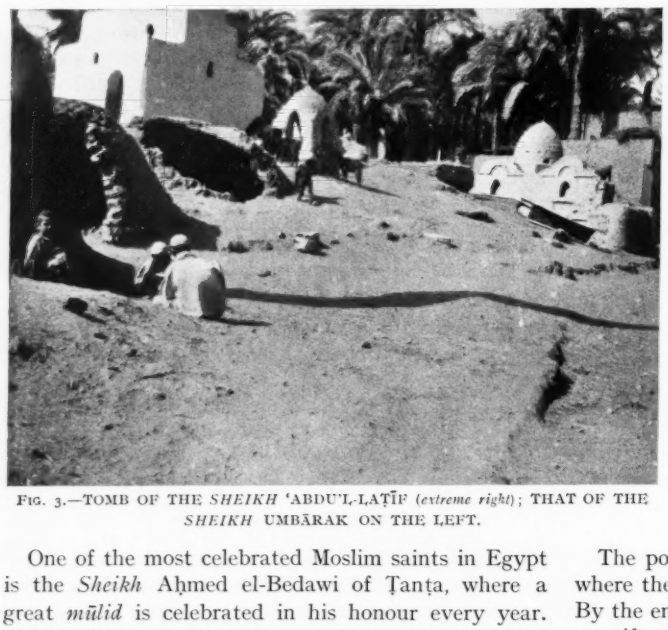

FIG. 3.—TOMB OF THE *SHEIKH* 'ABDU'L-LAṬĪF (*extreme right*); THAT OF THE *SHEIKH* UMBĀRAK ON THE LEFT.

One of the most celebrated Moslim saints in Egypt is the *Sheikh* Aḥmed el-Bedawi of Ṭanṭa, where a great *mūlid* is celebrated in his honour every year. It lasts for a week and is attended by thousands of people from all over the country. Huge sacrifices of sheep and oxen are made at the saint's tomb on this occasion, while his devotees seize the opportunity of invoking his aid for every possible want, and for protection from every form of evil fortune.

A False Wife Shown Up

The following story connected with the *sheikh* was recounted to me this year by one who vouches for its truth. There was once a *darwīsh* (a member of a Muhammadan religious order) who lived in a village near Ṭanṭa, and whose custom it was to pay a yearly visit to the tomb of the *Sheikh* Aḥmed el-Bedawi on the occasion of his *mūlid*. The *darwīsh* always took sheep and oxen with him to slay at the sacred tomb, besides bringing other offerings.

One year, when the time of the *mūlid* approached, he found himself without any money, and he did not know what to do about his yearly visit to Ṭanṭa; for how could he approach that holy shrine without his customary gifts? The *darwīsh* was married, but his wife did not love him, and she longed to become the wife of a rich neighbour. The *darwīsh* told his wife of the difficulty he was in, owing to his poverty, and when she had heard all, she thought to herself that now was her opportunity to get rid of her present husband and to secure the richer man. Accordingly she went to the rich neighbour privately, told him of the difficulty they were in, and suggested that he should lend them one hundred pounds, on the solemn promise from her husband that he would pay it back on the day that he returned home from Ṭanṭa. In order to make this promise secure, the husband was to swear by the triple divorce that he would fulfil it. Having satisfactorily hatched this plot, she returned to her husband and suggested that he should go to their wealthy neighbour and ask him to lend him one hundred pounds to enable him to attend the *mūlid* at Ṭanṭa. The husband at once fell into the cleverly contrived trap and set off to make his request to the rich man. The latter, after pretending to think over the matter carefully, consented to lend the woman's husband the money, on the condition that he swore by the triple divorce that he would pay back the whole sum on the day that he returned from the *mūlid*. To this the *darwīsh* readily assented.

The poor man and his wife then set off for Ṭanṭa, where they stayed for the whole week of the festival. By the end of that time all the money had been spent on gifts to the *sheikh* and the man had no money with which to pay his debt. He was at his wits' end, for he knew that if he could not produce the hundred pounds, he was bound by the most solemn oath to divorce his wife. But on the last night of his stay at Ṭanṭa, while he slept, a man appeared to him and handed him one hundred and fifty pounds, saying, "Take this and repay your debts." He also told him how bad and false his wife was, and revealed to him the whole of her treacherous conduct.

The *darwīsh* thankfully accepted the money, returned to his house, repaid his debt, and divorced his faithless wife. The man who had come to his aid in this miraculous manner was the *Sheikh* Aḥmed el-Bedawi, who in such ways, it is believed, often helps his faithful

devotees in their time of need. It is said that in the years to come the poor *darwīsh* became rich, and the rich man who married the unfaithful wife became poor.

A Female Sheikh

In one of the provinces of Upper Egypt, close to the desert hills, lives the *Sheikha* Salūḥ. This woman has a great reputation for holiness, and people flock to her, in times of difficulty, from all quarters. Her skin is very dark from constant exposure to the sun, and her head, on which she wears no veil, is covered with a crop of hair, thick and long like the wool of a sheep; from beneath her brows peer dark, sharp-looking eyes. Her clothes are somewhat scanty, consisting merely of a piece of linen rag and a sort of coat. She remains out in this desert solitude all day, and at night, so I was told, she sleeps alone "in the mountain." The people call the often precipitous high-desert hills "the mountain" (*el-gebel*), so she probably takes shelter in one of the natural or artificial caves which exist in great numbers in the hill-sides. On one occasion, when a number of men and women had come to consult her, one of the men asked her what had become of his most valuable camel which he had lost. The *sheikha* at once told him the exact hour in which this loss had occurred, and informed him that one of his sons had stolen it one night and had sold it to a man in another village in the same province. She then told him the name of the man who had bought it, and said that if he went to the house of the purchaser, he would be able to recover his lost property.

Another man then came forward, and, when he had presented the *sheikha* with a small sum of money, she told him his name and the name of his village, though he was quite unknown to her. She also informed him that he had three sons and one daughter—a perfectly correct statement—and said, moreover, that on his return home he would find that his daughter was ill. This information also proved to be quite true, as the man, who is a friend of mine, told me afterwards.

The customs and beliefs connected with these *sheikhs* show many traces of ideas that have come down from ancient times. I hope to deal with these survivals in some future number of DISCOVERY.

FREUD AND HIS CRITICS

AFTER some years of almost undisputed pre-eminence among the pioneers of Psychology, Freud, who first introduced the theories of Psycho-analysis and based on them a system of treatment of neurotics, has been of late submitted to searching criticism. In the *Revue générale des Sciences* for September, and in the October number of *Scientia*, apppear articles by G. Marinesco and Leonardo Bianchi respectively which should be carefully studied by all who are interested in this subject.

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A Working Philosophy of Life

By W. Tudor Jones, M.A., Ph.D.

BERGSON'S doctrines form one of the most simply expressed and untechnical philosophies of the present day. In the original it is as easy to read him as to read a novel, and yet he deals with some of the most fundamental problems of life and existence.

Bergson's Life and Personality

Henri Bergson was born in Paris on the 18th of October 1859, and received an excellent education. He distinguished himself very early in mathematics, and it was through the gateway of mathematics that he entered into philosophy. After a period of lecturing in several schools and universities in France, he was elected in 1900 Professor of Philosophy in the Collège de France, and in 1901 was elected a Member of the French Institute. About two years ago he retired, and his place in the Collège de France has been filled by his well-known interpreter, Edouard Le Roy.

Bergson is not a recluse in any sense whatever. Hard as his work as a student has been, this has not in any way affected his charming personality. He is one of the most modest as well as one of the most fascinating of men. Along with the mental qualities of a man of genius he combines the power of eloquence in a remarkable degree—a power that drew crowds of people to his lectures from all parts of the world. He has been able in a wonderful manner to put his immense learning on one side when it is necessary, and to feel perfectly at ease with humble men and women. The natural, social life of the day is as interesting and important for him as the life of profound meditation over the deepest problems of science and metaphysics.

Is Discovery Possible in the Realm of Mind?

The world is often apt to conclude that discovery is only possible within the realm of nature. The discoveries in the various domains of physical science have been so extensive and the results have proved so tangible and fruitful that such a mistake is natural enough. Science has illuminated many dark recesses of nature; but this is also true in the realm of mind, and no one in our generation has shown the fact more clearly than Professor Bergson. He has shown us how mind is related to nature on the one hand, and how it is related to itself on the other. The various branches of the natural sciences have their contributions to make with regard to human personality, but they do not exhaust the explanation of it. Discovery

in the realm of mind takes place, according to our author, by taking constant heed, on the one hand, of the play of external forces upon man, and, on the other, by taking heed of what actually occurs within the various forces of the mind itself. The world and we ourselves have to be taken into account before a satisfactory meaning and value can be given to human personality. Any new light cast on the working of the forces of the mind contributes as actual a discovery as the observation of a new star or the behaviour of a new kind of insect-life hitherto unexplored. Let us, then, see what light Bergson has cast on man in his relationship to the universe and to life.

The Universe and Life in Relation to Man

He points out that it is absolutely impossible to interpret the physical universe from the old materialistic point of view. It is impossible here to describe all the evidence of this which Bergson shows to be present in his explanation of the physical universe. He takes matter as something which would have remained eternally stagnant, unchangeable, had it not been that there was some other element present besides a material one, an element which was working upon matter, compelling it to undergo the myriad transformations which have taken place on the face of this earth. This other element is spirit or life. It is the actual work of this higher element which has compelled matter to bend and change into the various forms which we perceive in the physical universe. Ostwald, the great chemist, states something similar with regard to his conception of energy. Had it not been for the presence of energy as the vehicle of matter, no evolutionary process would have happened. We are, then, warranted in holding that from the very constitution of the physical universe there have been present from the beginning (if there ever was a beginning) two elements, matter and life. Bergson has not as yet spoken of this element, life, in a religious sense, but his results lead to the conclusion that whatever comes out in the physical world must have been caused by something akin to itself, eternally present and active. Here we seem to be on the level of something like a religious idealism in our scientific conception of the universe.

When we pass from his conception of the relation of matter and life to his conception of the origin of life itself, we come face to face with results strikingly similar. He is aware that mechanical and biochemical elements play a very important part in all forms of life, but he would dissent entirely from every attempt made to reduce life to these material elements. Indeed, he would go so far as to say that everything that changes must be more than material. We have already seen that Bergson conceives matter as remaining for ever the same unless life works upon it. Once life starts working upon matter, transformations immediately begin to appear; and if the work continues, matter rises by means of this work of life to ever higher levels on the ladder of existence. Years of investigation in the realm of biology had led Bergson to this conclusion, which is in harmony with that of a large number of the most prominent biologists in all the countries of the world. Life can only be truly interpreted in the terms of life itelf. Bergson here again is insistent on the fact that in every form of life there is present an element higher in its nature than the material, chemical combinations which we find present. The latter are present certainly, but nothing less than *life itself*, by means of its own inherent nature, is capable of enabling these elements to work, and of directing matter along certain definite courses—" first the blade, then the ear, and then the full corn in the ear."

Instinct and Intelligence

Perhaps one of the most important contributions to knowledge which Bergson has made is that which relates to *instinct*. The origin of this he traces to the workings of the element termed life. In his book on *Creative Evolution* the workings of this unexplainable capacity are delineated with a master's hand. The animal has remained at this level of instinct. But it is a level not to be disparaged. The animals, the birds, and the insects are superior to us in many important ways. This fact came vividly to my mind in crossing the English Channel during the month of August of this year. The small boat behaved badly on the choppy sea. Practically all the passengers were wet through with sea-water, and the strong wind made progress difficult. But the gulls were flying around us and, as it seemed to me, thoroughly enjoying the elements and smiling on man's clumsiness and helplessness. We could not fly, and were at the mercy of a poor boat. Bergson shows how at a high stage in the evolutionary process a tremendous change took place. Prior to this change every living thing on the face of the earth lived on its ready-made capacity—instinct. Very probably this ready-made capacity has been gradually weakening in some of the higher apes, who may have found their food without having to call into activity much of the ready-made capacity, since a few rough natural tools enabled them to secure what they required. In any case, *intelligence* came into the world, and the two forms of life separated and have remained separate ever since. The animal continued to live on its instinct; man began to live by his intelligence. This intelligence became the power of creating tools for man's needs. He had now lost a great deal of his instincts, and was forced to

invent aids in the physical world for the satisfaction of his needs. And that has been the story of intelligence, and the story is marvellous. To it we owe the knowledge, the civilisation, the society, the morality, and the religions of the world. No one will deny that on the whole this was a real advance in the life of the world. But, as Bergson points out, although man gained much in this way, he also lost something of enormous value and significance when his instincts disappeared more and more into the dark background of his life. He can invent aeroplanes, but he cannot fly himself; he can construct machines which will carry him at the rate of a hundred miles an hour, but without these aids he is no match for the horse or the greyhound in a race. Bergson shows how helpless man is in other ways as well.

What is to be done? Evidently it is too late to rediscover many of the instincts, but it is not too late to discover something like them—something which pertains to the enrichment of our life and to the enhancement of our ability. Intelligence, being what it is, a tool-making instrument for the preservation and advancement of life, cannot grasp reality from the inside, but only from the outside—in other words, it can only obtain snapshots of reality. Bergson's great point here is to show that intelligence of itself can give us no more than *concepts* of reality. Through it we can know about the thing, but by means of it alone we cannot be present at the very heart of the thing and *actually be* the thing we know about. It is at once evident that to *know about* things on the one hand, and to find, on the other hand, that we do not really participate in the very enjoyment of the things we know about is a sign of something lacking in man.

Intuition

Man's inward life has not become, on the whole, more joyous and more able than it was 2,000 or 10,000 years ago, and, if emphasis is not laid on something besides intelligence, his life will never become richer, fuller, and more joyous. Bergson shows that life can transform itself and find a richness and a depth of which the ordinary individual has no inkling. How? By intuition. Intuition does not mean with Bergson any ready-made experience, but it does mean the potentiality for an experience which in the mental realm may mean what instinct has meant in the physical realm. This point of Bergson, from the psychological point of view, is an important discovery. We knew of something like it before in the realm of religious experience, but unfortunately we could not prove whether it was a truth or an illusion. Bergson shows that by "ruminating" or "chewing the intellectual cud" over an idea sufficiently deeply and sufficiently long, the idea gets saturated in the instinctive possibilities of our nature, and thus the idea becomes intuition. The idea is no longer an object of contemplation with an interval between us and it; it has now become a real part of ourselves. We thus see the difference between a *relative* knowledge of a thing and an *absolute* knowledge of it. "A comparison of the definitions of metaphysics and the various conceptions of the absolute leads to the discovery that philosophers, in spite of their apparent divergencies, agree in distinguishing two profoundly different ways of knowing a thing. The first implies that we move round the object; the second that we enter into it. The first depends on the point of view at which we are placed and on the symbols by which we express ourselves. The second neither depends on a point of view nor relies on any symbol. The first kind of knowledge may be said to stop at the *relative*; the second, in those cases where it is possible, to attain the absolute." (*An Introduction to Metaphysics*, p. 1.) There is no doubt that the author means that life cannot develop on its deepest level without periodical withdrawals from objects of sense. A great part of human life has to be spent in close connection with objects of sense. This is the portion of man: through the sweat of his brow or the pain of his hand he shall eat his bread. We cannot live without the constant use of the tool-making capacity. But Bergson would insist that "man doth not live by bread alone." He is meant not only for work, but also for enjoyment and the realisation of his own personality. He now sees that a stirring of the deeper nature, physical and mental, is requisite; that the *external* world has to be shut out at times and the world *within* us explored; that contemplation on what seems to be of value must play a part in life if we are to pass from relative to absolute knowledge.

This seems to me to be one of the main messages for the present generation. Ideas are necessary—ideas of objects in the external world. There ought to be a constant desire to know, especially to know the meaning and value of the objects which pertain to our particular vocation. And such knowledge can be taken into the mind when we are not actually at work in the world; it can be pondered over, and its value for the vocation and for the world can be seen. When this happens there will be no need to call anybody to do his work properly. A farm-labourer, for instance, will come to see that his driving the milk-cart to the station is not just to make money for his employer or to earn his own income, but is one of the countless necessary daily events in the vast scheme of the world's life; the milk he drives to the station will be conveyed by train to London, and will be consumed by a worker in the Metropolis the next morning. A postman will come to look on his job

as not merely handling lists of writing wrapped in envelopes and pushing them through letter-boxes, but will see that he is the agent in a complex process, by which news of great importance is passing from human being to human being across hundreds or even thousands of miles—news, the collective value of which will shape the world's destiny and his own as well. These are rough and simple examples, but they suffice to show that the deeper values we possess of the work have now become our intuitions, and our soul will be always in what we do.

But, also, we are called away at times from our work by the deepest mind within us. Ideals and aspirations which we *know*, but which we have not as yet realised as a genuine part of our personality, present themselves before the mind. The mind reflects upon these with "intellectual sympathy" and, if this is continued long enough, the ideal begins to burn within us. A complete transformation takes place in life. The man now *is* the ideal realised. It is at once clear that he is not the same kind of man *after* such an experience as he was before it. The teaching contains a religious significance which seems akin to the deepest meaning of the Christian Gospels.

The Nature of the Soul and Man's Future

From what has already been stated it follows that Bergson conceives of man as possessing in body and mind two different qualities working in the closest possible relation. His arguments that mind and memory are other than cerebral movements and functions are, in the writer's belief, unanswerable. In some of his later writings man is shown, in the development of his life, in some such manner as has been here sketched, to be creating a life, within the *reality of time*, and in the atmosphere of *freedom*, which becomes super-personal and which may survive the shock of death. To get our young generation interested in questions of this nature means the creation of new beings and of a new world.

BIBLIOGRAPHY

In this list the most important works which have been translated into English are given:

Time and Free Will. (Allen & Unwin.)
Matter and Memory. (Allen & Unwin.)
Creative Evolution. (Macmillan & Co.)
Introduction to Metaphysics. (Macmillan & Co.)
Laughter. (Macmillan & Co.)
Spiritual Energy. (Macmillan & Co.)

Many volumes have been written in English on Bergson's philosophy. The following two volumes appear to the writer of this article to be the most reliable:

A New Philosophy: Henri Bergson, by Edouard Le Roy. (Williams & Norgate.)
The Philosophy of Bergson, by A. D. Lindsay. (Dent & Sons.)

Modern Industries—V

Manufacturing Arsenic in Devon and Cornwall

By Edward Cahen, A.R.C.Sc., F.C.S.

THE chief impression that strikes a visitor on seeing an arsenic works for the first time is the appearance of dilapidation and primitiveness which it presents. This is due in part to the surroundings, often the remains of earlier industries, partly to the primitive apparatus actually used and still found to be the best for the purpose. Secondly, the visitor invariably asks for what purpose all this arsenic is being manufactured, no doubt thinking of the minute quantities he has read about in the accounts of some poison trial. It is, in fact, rather startling to see this deadly white powder heaped up in front of the chambers when they are being cleared, or filling casks in the store.

Devon and Cornwall have long been famous, not only for their cream, but also for their white arsenic. So pure, indeed, is the latter—manufactured, be it remembered, by the ton—that it needs the utmost ingenuity of the chemist to detect any difference between it and the assay samples put up in small bottles and sold in London with the guarantee and analysis of such well-known firms as Kahlbaum and Merck.

Sources of Arsenic

The chief source of arsenic is an arsenical pyrites, a mineral of a silvery grey colour, locally known to the miners as mundic, but scientifically called mispickel. This is either mined specially for the purpose, or obtained from the dumps of older workings such as those of the copper and tin industries, where the arsenic was left in the detritus after the metals had been recovered.

These dumps form quite a lucrative source of arsenic, for the mundic, which is heavy, can easily be separated from the lighter material by washing with water. For this purpose a James table or similar contrivance is used; this consists of a large oblong grooved table, slightly inclined, on to which the finely crushed material to be washed is fed. Down one side of the table there is a series of small jets of water which wash the material down the table, which is kept gently "jigging" the whole time. The heavier mundic travels to the end of the table and falls off into a receptacle, the lighter particles passing away to one side.

Arsenic Burning

The mundic from either source is then taken to the arsenic works proper and fed into furnaces. The type

of furnace more commonly used is a rotatory furnace, the round hearth of which is kept gently rotating as the material is heated by means of a fire beneath. The mundic is fed in through a hopper at the top, and the arsenic burner is able to watch the process through a small door at the side. The strongly fuming mass is mechanically raked during the process, the ash or rinkle, as the workmen call it, falling off the edge of the furnace floor into the pit. The other furnace sometimes employed is of the ordinary reverberatory type, in which the flames actually play over the surface of the mundic which is "ravelled" from the side by a pole some eight or nine feet long, wielded by the furnacemen with great dexterity. Much depends upon the arsenic burners' skill in the management of the temperature and mundic in this type of furnace.

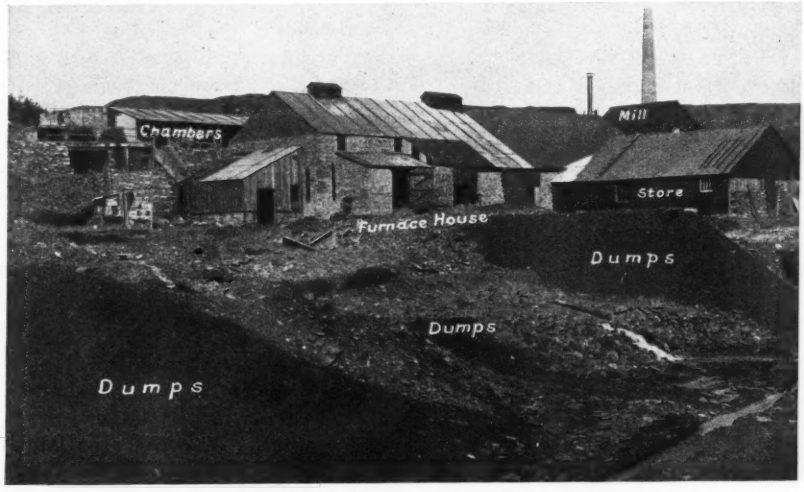


FIG. 1.—GENERAL VIEW OF AN ARSENIC WORKS.

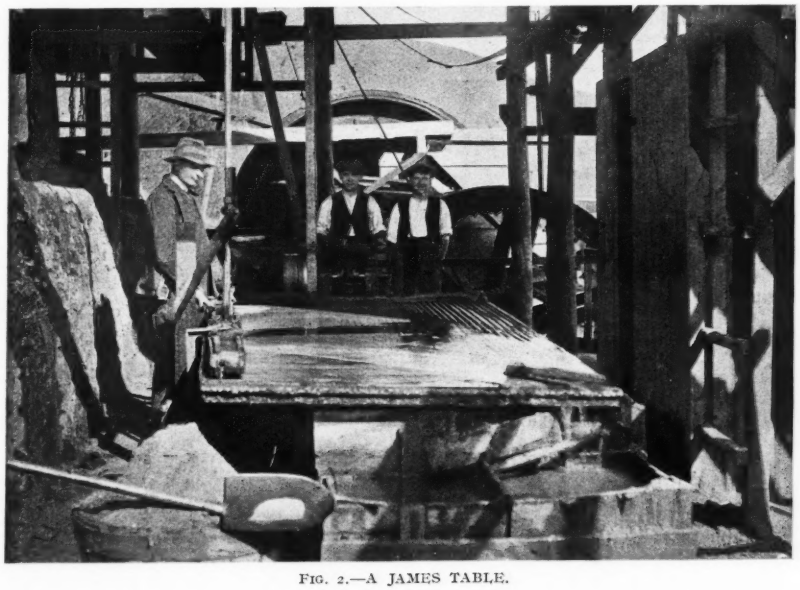


FIG. 2.—A JAMES TABLE.

When once alight these furnaces are kept going day and night, Sundays and holidays, the men working in shifts of eight hours at a time, until it is judged that sufficient arsenic has collected in the chambers attached to the furnaces by a flue and designed for the deposition and retention of the arsenic vapours. The fire is then drawn or the gases are diverted, by means of a damper, to another "set," as a series of chambers is called.

The Refined "Soot"

The product of this first process is arsenic soot and is generally of a greyish colour, though it varies greatly from buff to black, according to the material burnt and type of furnace used.

Arsenic soot is also obtained from other industries in the neighbouring districts, coming, for instance, from the roasting of tin ores before the latter can be smelted. The larger smelters recover this by-product in large flues designed for this purpose. Arsenic soot varies greatly in the amount of white arsenic (As_2O_3) it contains, but in any case it is subjected to the refining process before it is placed on the market. The soot is removed from the chambers and returned to a similar furnace called a "refiner," where it is again heated and volatilised. Here, however, smokeless coal is used so that the arsenic may not be contaminated with particles of carbon from the smoke, and in the case where a round furnace is used it is not rotated and there is no raking apparatus. The fumes of oxide of arsenic pass up the flues to the chambers, where they condense in the form of a beautiful white crystalline powder on the floor, walls, and ceiling. The long flues and rows of chambers are quite a characteristic feature of an arsenic works and contribute to the appearance of dilapidation and antiquity which we have referred to, for the flues are outwardly quite roughly constructed of brick or the local stone, following the slope of the country-side for a considerable distance upwards to the stack, where the sulphur dioxide escapes into the atmosphere. The object of these long flues is to retain the last traces of arsenic, which would otherwise be detrimental to vegetation near the works. The flues are cleaned out about once a year and the arsenic profitably recovered.

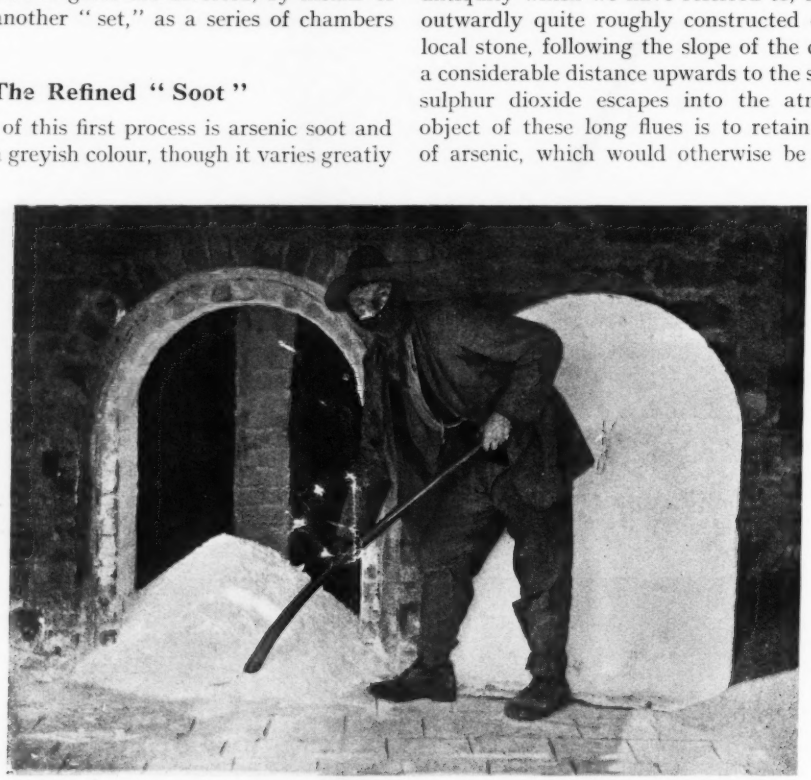


FIG. 3.—CLEARING OUT THE ARSENIC SOOT.

The chambers where the soot or white arsenic is collected are small vaulted brick rooms connected one with another by an arched opening so placed that the gases, in their passage from one chamber to the next, strike a relatively cool wall before finding their way to the exit placed in the corner diagonally opposed. As the white arsenic vapours zigzag through these chambers, they condense and deposit in the form of fine white crystals. Along one side of a "set" lies a series of doors, which are closed with clay while the process is proceeding, and are afterwards opened in order to extract the arsenic. This, looking like so much snow, is simply shovelled out into trollies and taken off to the mill.

Grinding the Arsenic

The milling process is rendered necessary so as to ensure a uniform sample, for the arsenic deposited in the chambers nearest the furnace is much denser than that in those farthest away. The mills used consist of two granite stones, dressed on the works, one of which is superimposed on the other and slowly rotated by means of a steam-engine or water-wheel. The arsenic is fed in at the top and the finished product is collected in barrels underneath.

The mills activated by means of a water-wheel are particularly interesting from an antiquarian point of view, for there is just such a mill illustrated by means of a woodcut in Agricola's *De Re Metallica*, the first Latin edition of which appeared in 1556. This work was translated by H. C. and L. H. Hoover and published by *The Mining Magazine* in 1912.

The arsenic thus produced and sold by the ton is the white oxide, and is largely used in the manufacture of sheep dip, weed killer, and fruit sprays, to mention but three of its many uses. The arsenic from Devon and Cornwall is in constant demand on account of its uniform good quality, though it has to meet very severe competition from abroad, where it can be produced somewhat more cheaply than is possible in this country.

Much has been written about the dangers incurred by the workmen on an arsenic works, but this appears to be greatly exaggerated and, generally speaking, they are a fine, healthy set of men.

An Aztec Secret Society

By Lewis Spence

Author of "The Gods of Mexico"

THOSE very human and sympathetic apostles whom devout Spain shipped to pagan Mexico soon after its conquest by Hernando Cortes early in the sixteenth century quickly discovered that it was not so much a religion from which they had to wean the native mind as an elaborate ritual mingled with magical practice. The dusk of magic which shadowed the bizarre crowded cities could almost be felt by these brave priests. It was easy enough to combat an idolatry regarding the higher conception of which the people had only loose ideas and legendary glimmerings. But the more popular devil-worship which accompanied it had a far stronger hold on the native affections. The Aztec was enthralled by it; his whole life from the cradle to the grave was ordered by its inevitable and ghastly provisions.

No sooner had the Mexican aristocracy been accounted for by slaughter or conversion than a significant change took place in the tendency and character of the native faith. The Aztec priesthood, realising that if its doctrines were to survive at all it must make a powerful appeal to the mass mind of the nation, threw every ounce of energy into the task of shaping the superstitions of the lower orders into a deadly instrument of vengeance against the whites. In this new movement magic of a repellent kind was joined with political conspiracy against Spanish supremacy, and the extraordinary cult thus developed came to be known as Nagualism, whose chief deity was Satan himself, if we are to credit the writings of those who opposed it and laboured untiringly for its destruction.

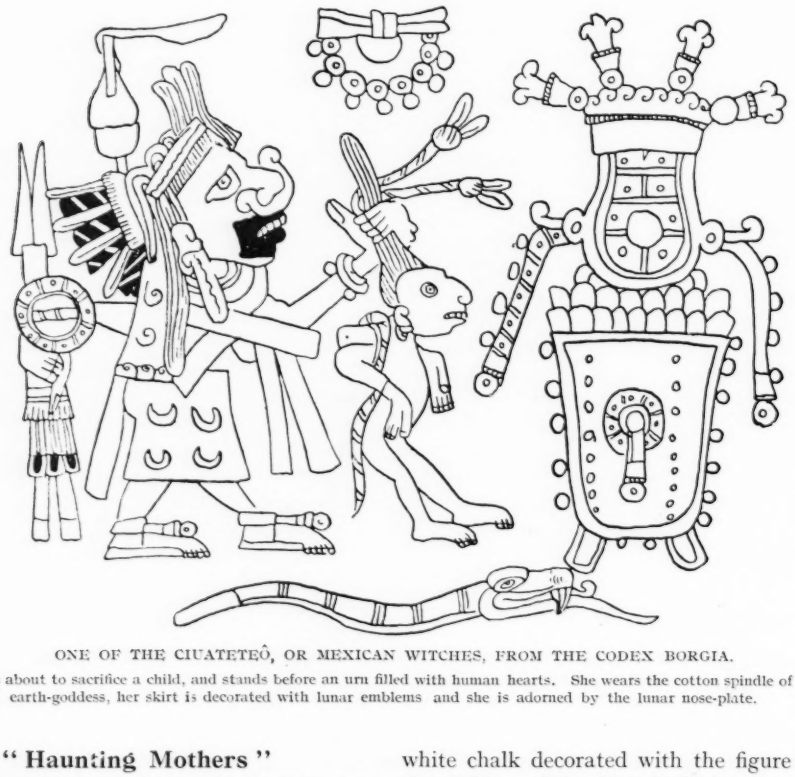
Local Brotherhoods

This mysterious secret society had branches in all parts of the country and its members were classed in varying degrees, initiation into which was granted only after prolonged and rigorous experience. Local brotherhoods or lodges were organised and there were certain recognised centres of the cult. At each of these places was stationed a high priest or master magician, who had beneath his authority often as many as a thousand lesser priests, and who exercised control over a large district. The priesthood of this diabolic guild was handed down from father to son. The highest grade appears to have been that of Xochimilca or "Flower-weaver," probably because its members possessed the faculty of deceiving the senses of votaries by strange and pleasant visions induced by potent drugs, as, for instance, the *peyotl*, a plant of the genus *Cocolia*, which resembles garlic. Like the *kava* of the Polynesians, it was first masticated and then placed in a wooden mortar, where it was left to ferment. Another plant employed by the Nagualists for the purpose of inducing ecstatic visions was the *ololiuhqui*, from the seeds of which a liniment was crushed and rubbed over the body after being mixed with the ashes of spiders, scorpions, and other noxious insects.

All Christian ceremonies celebrated by the friars were at once annulled by the Nagualist priesthood. If a child were baptised with the holy water, it was immediately carried to the cave or secret meeting-place of the Nagualists, where the rite was "reversed" by the aid of black magic. This was effected by endowing the child with a nagual or animal guardian, a totem [1] protector, which was regarded as its spiritual guide and mentor, to whom in all the difficulties and perplexities of life it must turn for advice and instruction. These animal guardians were selected according to the dates against which their pictures appeared in the

[1] A totem is the natural object, such as an animal, taken by primitive and semi-primitive peoples as the emblem of their clan or fellowship.

native calendar. For example, in the Nagualist calendar for January, the first day of the month was represented by a puma, the second by a snake, the eighth by a rabbit, the fourteenth by a toad, the nineteenth by a jaguar, and so on. The animal of the day was invoked by the priest, who offered up sacrifice to it, implored its good offices for the child, and then instructed the infant's mother to carry it to a certain lonely spot, where the nagual would appear and become attached to it for the remainder of its life. of a particularly vindictive and disgruntled nature. Strangely enough, the same notion is to be met with in present-day Burma, where the spirit of the woman who leaves a new-born babe behind her is regarded as a peculiarly malevolent ghost. These witches are represented in the native paintings as dressed in the garments and insignia of the goddess Tlazolteotl, the Mexican patroness of witches. They wore a skirt on which cross-bones were woven, they carried the witch's broom of stiff grass, and their faces were smothered in



ONE OF THE CIUATETEÔ, OR MEXICAN WITCHES, FROM THE CODEX BORGIA.

She is about to sacrifice a child, and stands before an urn filled with human hearts. She wears the cotton spindle of the earth-goddess, her skirt is decorated with lunar emblems and she is adorned by the lunar nose-plate.

The "Haunting Mothers"

Many of the worshippers of these beast-gods pretended to have the power of transforming themselves into the bodily shapes of their patrons, just as the witches of mediæval Europe claimed the ability to take animal shape. It is indeed strange how closely the rites of Nagualism resembled those of the European witches' Sabbath. But it seems to have been an orgy in which the living and the dead mingled, for it was attended not only by those women who dabbled in unholy rites, but by the great company of those deceased women who had in their day practised black magic. Those were known as Ciuateteô, or "Haunting Mothers." Some of them were merely unhappy mothers who had died leaving young children behind them, and who for this reason were supposed to be white chalk decorated with the figure of a butterfly, the emblem of the disembodied soul.

These furies were supposed to inhabit the region of the west. At midnight they descended to earth and mingled with the living witches in horrid festival. The Aztecs believed that many complaints, particularly epilepsy, were sown broadcast by these strigæ, and so that no evil emanations might enter their houses, they stopped up the chinks in the doors and windows, and even the chimneys, on certain nights of the year which were peculiarly associated with the dead witches.

A picture of their queen and patroness in the Codex Fejérváry-Mayer in the Free Public Museums at Liverpool bears an extraordinary resemblance to the European witch of tradition. She is represented as

nude, wearing a high peaked hat, and is seen taking her flight through the air on a broomstick. In other pictures she is seen standing beside a house, accompanied by an owl, the whole representing the witch's dwelling, with medicinal herbs drying beneath the eaves. Thus the evidence that the Haunting Mothers and their patroness present an exact parallel with the witches of Europe seems pretty complete, and should provide those who regard witchcraft as a thing essentially European with considerable food for thought. The Nagualists smeared themselves with a magical ointment by virtue of which they believed they could fly through the air, and engaged in wild and intemperate dances precisely as did the adherents of Vauldérie in France, or the witches of England; they met at cross-roads, where they danced to pipe and tabor, and they brewed strange potions, love-philtres, and poisons quite in the manner of the Lancashire or Devonshire hags.

Magic Arts of all Kinds

But shape-shifting and witchcraft were not the only magical resources of the Nagualists. Their arts were manifold. They could render themselves invisible and walk unseen among their enemies! They could transport themselves to distant places, and returning, report what they had witnessed! Like the fakirs of India, they could create before the eyes of the spectator rivers, trees, houses, animals, and other objects. They would, to all appearance, rip themselves open, cut a limb from the body of another person and replace it, and pierce themselves with knives without bleeding. They could handle venomous serpents without being bitten, as can their representatives among the Zuñi Indians of Arizona to-day, cause mysterious sounds in the air, hypnotise both men and animals, and invoke spirits who would instantly appear. Of these things the credulous missionary friars believed them fully capable. What wonder, then, that they were regarded by the natives with a mixture of terror and respect?

The esoteric details of the secret ceremonies and doctrines of Nagualism have never been fully revealed, and it is only from scattered passages in the writings of the Spanish missionary friars that we can throw any light on this mysterious secret society. When the Austrian traveller Dr. Scherzer visited Guatemala in 1854, he found Nagualism in full force in the more remote districts, where there is good reason to believe it still flourishes.

LIST OF REFERENCES

D. C. Brinton, *Nagualism*, 1892.
Lewis Spence, *The Gods of Mexico*, 1923.
M. Beuchat, *Manuel d'archéologie Américaine*, 1912.
E. Seler, *Gesammelte Abhandlungen*.
Article in Hastings's *Encyclopædia of Religion and Ethics*.

An Imperial Airship Service

By Major W. T. Blake

COMMANDER BURNEY first placed his scheme for an Imperial Airship Service before the Government about two years ago, but since then it has undergone various modifications, until the idea has been accepted in principle by the Government, and negotiations are now taking place between Commander Burney and the Treasury with regard to financial matters. If these are settled satisfactorily, as it is anticipated that they will be, it should be possible to have the first airship in commission in 1925.

In laying his scheme before the Air Conference in February this year, Commander Burney stated that three principal benefits would accrue from the successful establishment of an Imperial Airship Service. These were the imperial and political advantages accruing from a safe and cheap form of transport; the value in war-time of a fleet of airships together with fuelling bases all over the world; and the value of a commercial company with British capital operating a service on a profit-making basis.

Briefly, the scheme is for the inauguration of an airship service from England to Egypt, India, Singapore, and Australia. At first only the Egyptian route will be worked, this being extended to India when more ships are available, and later to Australia, the full service of two airships each way between England and India and one between England and Australia per week being reached about 1927.

Subsidies by the Government

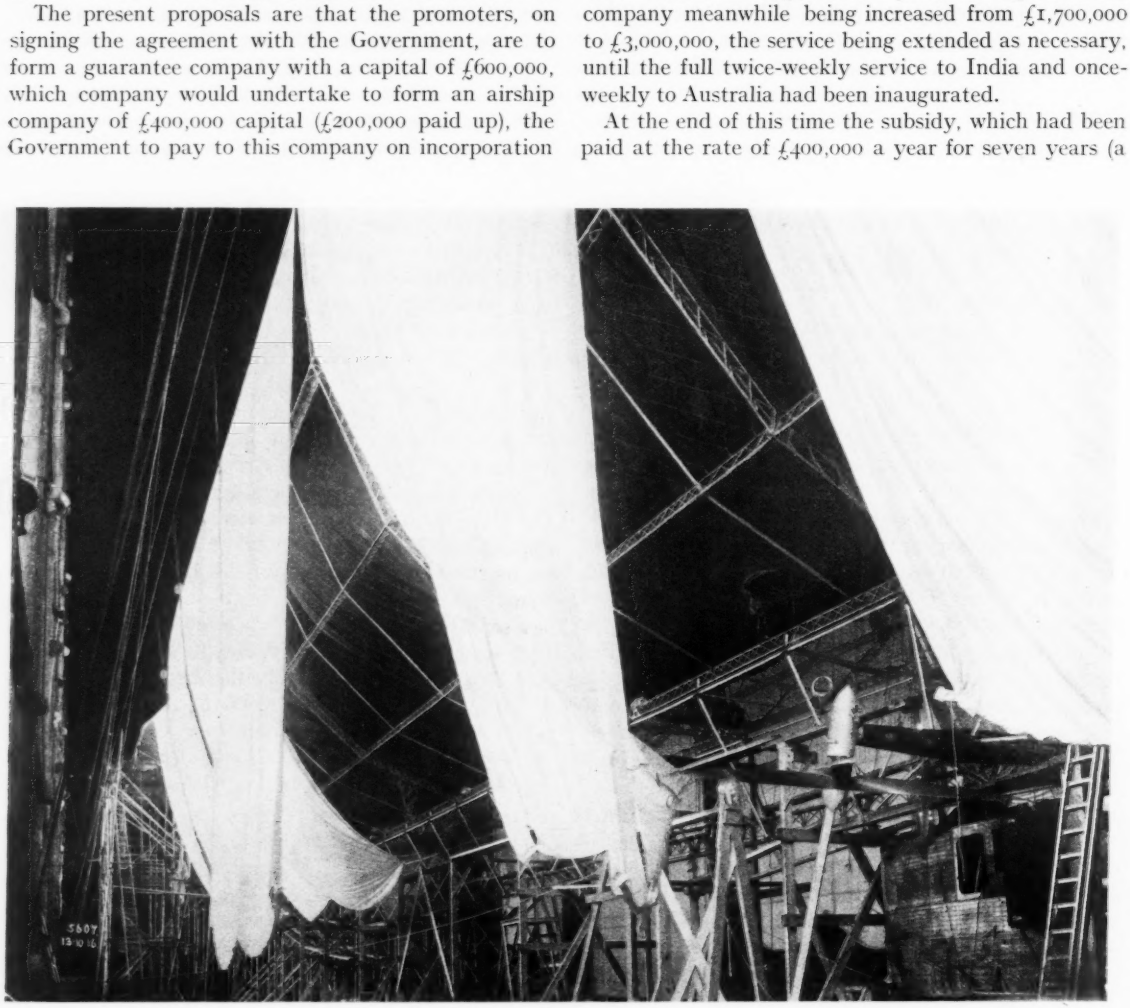
In order to build these vessels a capital of £4,000,000 was originally suggested, so that six ships could be built, sheds and mooring masts erected, and fuelling depots and mooring bases constructed at Port Said, Bombay, Rangoon, Singapore, and Perth (Australia). The whole of the organisation was to be at the disposal of the Admiralty in time of war, and in return for this the Government was asked to guarantee the debentures as to principal and interest, and the ordinary shares as to dividends only, for ten years at the rate of 6 per cent.

The scheme was rapidly taken up by influential bodies, Messrs. Vickers Limited and Shell-Mex Limited being the principal financial backers. After considerable delay the proposition has been accepted by the Government, but in the interval since the first proposal the financial estimates have undergone considerable

modification, and it is with the modified scheme that the Treasury is at present concerned. The technical side has not been altered except to curtail it somewhat in accordance with the reduced financial commitments.

The present proposals are that the promoters, on signing the agreement with the Government, are to form a guarantee company with a capital of £600,000, which company would undertake to form an airship company of £400,000 capital (£200,000 paid up), the Government to pay to this company on incorporation has been able to run a weekly service to India for at least three months prior to the date of the renewal of the subsidy, the Government would agree to pay three further subsidies of £400,000 a year, the capital of the company meanwhile being increased from £1,700,000 to £3,000,000, the service being extended as necessary, until the full twice-weekly service to India and once-weekly to Australia had been inaugurated.

At the end of this time the subsidy, which had been paid at the rate of £400,000 a year for seven years (a



VIEW SHOWING METHOD OF CONSTRUCTING THE HULL OF A RIGID AIRSHIP.

The girders and bracing wires are in position, the gas bags have been installed and the outer envelope is about to be placed in position.

£400,000 as the first year's subsidy. The company would then erect the necessary mooring masts and plant, and build one airship of 5,000,000 cubic feet capacity in order to test the route to India.

Subject to this airship passing its trials and carrying out a flight to India in less than 100 hours' time, the subsidy at the rate of £400,000 a year would become payable for a further three years, and the company would increase its capital from £400,000 to £1,700,000. If, before the expiration of the third year, the company total of £2,800,000), would become repayable to the Government, half the profits above 10 per cent. earned by the company being paid to the Treasury, until the full £2,800,000 had been paid off.

Airships with Gas-bags of Ten Acres

The vessels to be employed on the service will be of 5,000,000 cubic feet capacity, and will in all probability be built by Vickers Limited, who constructed four of our fourteen rigid airships during the war.

Such vessels will be approximately 760 feet in length and 110 feet in diameter. They will have an air displacement of 150 tons and a speed of 80 m.p.h., and will be able to carry 200 passengers and 11 tons of mails and freight on a non-stop flight of 2,500 miles, which would amply cover the distances from England to Egypt and Egypt to India. Carrying no cargo, this type of ship would have a range of 11,500 miles at 80 m.p.h., or 24,000 miles at 40 m.p.h. Each ship will have six engine units, of which two will probably be held in reserve. The area of fabric for gas-bags for each ship is 40,400 square metres, which is about 10 acres.

A possible new feature may be the introduction of hydrogen-burning, in addition to liquid fuel for the engines. It must be realised that, as the airship consumes liquid fuel and the gross weight therefore decreases, some of the hydrogen which fills the gas-bags has to be released in order to keep the airship at the proper level. It is suggested that it may be possible to burn this waste hydrogen in place of the liquid fuel in the engines, and experiments are now being carried out in this direction. Had the R34 been fitted for hydrogen-burning on her Atlantic flight, instead of landing at New York with barely 100 gallons of fuel left, she would have had nearly 1,000 gallons surplus, or sufficient to have carried her another thousand miles. Hydrogen-burning would enable the commercial load of a 5,000,000 cubic foot airship to be increased by 13 tons on a flight from England to Egypt.

In any case the new airships will probably not be fitted for using petrol, as this is considered the greatest danger to which modern airships could be subjected. Possibly kerosene will be used, though a heavier oil may eventually be substituted.

This will also have the effect of reducing fuel costs to about one-seventh of the present costs incurred when using petrol. Another factor is the increased number of hours an engine can be run without an overhaul, the increase being approximately from three hundred to eight hundred hours.

The estimated cost of building a 5,000,000 cubic foot capacity airship works out at about £150,000.

Mooring Masts Fitted with Lifts

Along the route to Australia will be two types of bases, one being a shed or docking base, and the other a mooring-mast base. For normal purposes a mooring mast is the simplest and most efficient method of anchoring aircraft. The ship can be brought to rest far more simply at a mast or tower than in a hangar, and can be released still more expeditiously. Passengers will enter the ship by means of lifts operated inside the tower to the top of which the nose of the airship is fastened. They will then enter the vessel along a covered gangway. Fuel and stores can also be taken up through the tower.

The estimated cost of these bases is £300,000 each in the case of the shed or docking base, which would also be fitted with mooring masts, gas plant, etc., and £100,000 for a mooring-mast base only. The masts themselves are estimated to cost about £20,000 each with equipment, whilst the sheds would cost £150,000 each, or approximately as much as an airship itself.

With regard to the financial return which might be expected on the route when the service is operating fully, the capacity of the ships would be 400 first-class and 400 second-class passengers per week, i.e. 100 first-class and 100 second-class on each voyage in each direction. In addition about 44 tons of mails and baggage could be carried. If the passenger freight is assumed to be 50 per cent. of the full load, and mails and baggage 70 per cent. of the full load—not an outside estimate—and first-class fares from London to India cost £70, second-class £45, mails $2\frac{1}{2}d.$ per oz. and parcels 1s. per lb., the total receipts per year would be £1,827,480. Running expenses for six ships, crews, gas, material, and depreciation, in fact all expenses, would be about £880,750 per annum, so that with a 50 per cent. load a profit of about £1,000,000 a year on the total capital of £3,000,000 would be made. Even if only 25 per cent. loads were carried, there would still be a small profit.

The final consideration is whether passengers would be tempted to travel by airship. In this connection the following comparison of existing times of transit, and times of transit by the future airship service are of interest:

—	Present Day.	Airship.	Saving.	
	days.	days.	days.	%
England to Egypt . .	6	$2\frac{1}{2}$	$3\frac{1}{2}$	= 58
,, ,, Bombay . .	15	5	10	= 66
,, ,, Rangoon . .	19	7	12	= 64
,, ,, Singapore .	24	8	16	= 67
,, ,, Perth (W.A.) .	28	11	17	= 61
Egypt ,, Bombay . .	9	$2\frac{1}{2}$	$6\frac{1}{2}$	= 72
,, ,, Rangoon . .	13	$4\frac{1}{2}$	$8\frac{1}{2}$	= 65
,, ,, Singapore .	18	$5\frac{1}{2}$	$12\frac{1}{2}$	= 69
,, ,, Perth (W.A.) .	22	$8\frac{1}{2}$	$13\frac{1}{2}$	= 61
Bombay ,, Rangoon . .	4	2	2	= 50
,, ,, Singapore .	9	3	6	= 67
,, ,, Perth (W.A.) .	13	6	7	= 54
Rangoon ,, Singapore .	5	1	4	= 80
,, ,, Perth (W.A.) .	22	4	18	= 82
Singapore ,, Perth (W.A.) .	17	3	14	= 82

Average saving = 66 per cent.

When to this saving is added the fact that the proposed airship fares are considerably lower than the present liner fares, and that the comfort and safety of travel by airship will be at least equal to that experienced at sea, there appears very little doubt

that there will be a sufficient number of passengers to be carried. And, as a minor consideration for the Empire, this great airship trunk route will call up hundreds of aeroplane routes connecting with the airship bases, so that the formation of the airship routes should greatly benefit the whole flying world.

Three Forgotten Phrygian Martyrs

By W. M. Calder

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An Early Christian City

THE city of Laodicea Combusta ("Laodicea the Burnt"), so called from the charred volcanic hills which form the most striking feature in its landscape, lay thirty miles north-west of Iconium. That portion of Phrygia formed part of the Roman province Galatia till A.D. 295, and was then incorporated in the province Pisidia. This district was the "Phrygian region" of the Acts of the Apostles, and it was evangelised from the Churches founded by the Apostle Paul in its two chief cities, Antioch and Iconium. For the first three centuries of our era, the history of this Laodicea (which must be distinguished from the "lukewarm" city on the Lycus, whose name has become proverbial as the description of a comfortable and complacent Christianity) is practically a blank. The name hardly appears in literature, and Laodicean inscriptions and coins belonging to these centuries are few. But fourth-century Laodicea has provided the epigraphist, and especially the Christian epigraphist, with an unusually fruitful field of study. In 1888 Ramsay published a collection of early Christian inscriptions from Laodicea (a few of them already published by Hamilton) which, if we except the epitaph of a deacon who held the heresy known as Novatian, presented no exceptional feature. A second Novatian epitaph (heretical epitaphs are exceedingly scarce in the early centuries) was copied by the Austrian explorers Heberdey and Wilhelm as they rode through Laodicea on their return from Cilicia, and published in 1896. Apart from these journeys, the site of Laodicea and its environs were practically neglected until the years 1904–1913, when several visits were paid to them by Ramsay, Callander, and the writer. These visits, year by year, yielded an epigraphical harvest of peculiar interest, and mark Laodicea as a site which will repay further investigation. Some of the results have been published; others are in course of publication. On the present occasion I will describe the epitaph of a Laodicean martyr, now for the first time identified as such, and will refer in passing to two other martyrs of whom the inscriptions of Laodicea have preserved a record. This will throw some light on the character of the Great Persecution as it affected Phrygia. The new martyr's epitaph was discussed in a paper read before the Byzantine section of the *Congrès International des Sciences Historiques* at Brussels in April 1923; it is here described, in complete form, for the first time in print.

Two Laodicean Martyrs

The epitaph of Julius Eugenius, Bishop of Laodicea Combusta from about A.D. 315 to about A.D. 340 or later, was discovered in 1908, and has taken rank as one of the most important of early Christian inscriptions. Its reference to a forgotten decree of the Emperor Maximinus II, ordering that Christians in the Roman service should be compelled to sacrifice to the statues of the Emperors without the option of resigning their posts, makes it an historical document of major interest; and it is the only early Christian inscription so far found in the "Phrygian region" which can be accurately dated. It thus forms the pivot of a chronological arrangement of the documents of this region. Eugenius tells us that he had suffered in the persecution of Maximinus II, while Valerius Diogenes was governor of Pisidia; that a short time afterwards he had been made Bishop of Laodicea, and that he had been Bishop for twenty-five years when he prepared his tomb. These details enable us to fix the commencement of his episcopate and the preparation of his last resting-place within a year or two of the dates given above. When he became Bishop of Laodicea, his principal concern was to "rebuild the church from its foundations"; and this statement throws a welcome but by no means unexpected light on the character of the persecution at Laodicea. A further glimpse of the sufferings of the Laodicean Christians was afforded by the discovery, in 1911, of a second inscription referring to the same Eugenius. This is the dedication, in five elegant elegiac couplets, four of which have been preserved, of a *martyrion* or memorial chapel which was erected by the Laodicean Christians, towards the close of the fourth century, to hold the relics of Eugenius and his martyred predecessor Bishop Severus. In this inscription—which, incidentally, informs us that the Laodicean community belonged to the sect of the Saccophori, a sect of teetotalers who used only water in the Eucharist—Severus is described as "the glorious victor in the contest of the Heavenly Father." Such language, at this period, could only be used of a martyr. Eugenius tells us in his epitaph that he had suffered many tortures in the persecution; the natural inference

from the building of a memorial chapel to the two bishops is that Severus had been put to death. This conclusion is, however, not absolutely certain, as the title of "martyr" was given to those who remained steadfast under torture, even if, like Eugenius, they survived.

Martyrs' Epitaphs very Rare

While the names of martyrs and details of memorial *martyria* abound in Christian inscriptions of the Byzantine period, it is well known that contemporary inscriptional records of martyrdom are exceedingly scarce. So far, apart from Laodicea Combusta, only three such inscriptions have been found in Asia Minor. Two of these are epitaphs, to be carefully distinguished from memorial dedications on *martyria* in which the relics of martyrs were deposited some time after their death. The first, which has long been known, but whose meaning was first pointed out by Ramsay, is the dedication by a bishop or presbyter in the Phrygian Pentapolis of a tomb to his "five children," of whom it is said that they "won the portion of life in one day." The language of this inscription suggests that these were spiritual "children," and most (but not all) good authorities agree in regarding them as martyrs. Their names, given in the epitaph, are unknown to the martyrologies. The second is the epitaph—from its expression it can be nothing but an epitaph—of a martyr Paul found at Derbe, which runs as follows: "Nounnos and Valerius built the tomb of Paul the Martyr in remembrance." Miss A. M. Ramsay, who published a drawing of the monument, has been followed by M. Grégoire in distinguishing this inscription from the later class of memorial dedications, and regarding it as the inscription of a tombstone set up over the grave of a martyr. This conclusion appears to me inevitable; I regard this Paul as a martyr who suffered in the Great Persecution, and had a gravestone erected to him immediately after the act of Constantine legalising Christianity. The open use of the term "martyr" on a tombstone could hardly have been tolerated by the officials of the Roman government during the persecution itself; the stone dates after the Act of Toleration (A.D. 312) or even after the final defeat of Licinius in A.D. 323.

The Romans and Kitchener of Khartoum

In the *Martyrdom of Polycarp*, the letter sent by the Church of Smyrna to the Church of Philomelium in or soon after A.D. 155 describing the passion of their bishop, we have evidence that, as early as the middle of the second century, the Roman government had adopted the policy of withholding the remains of martyrs (at any rate in Asia Minor) from their fellow Christians. St. Augustine, at a later date, was at pains to explain that the cult of the martyrs had nothing in common with pagan worship of the dead. But in Asia Minor the worship of the dead was a central feature of the popular pagan religion, and the Romans, in the second and third centuries, had as clear a motive for objecting to the erection of Christian *martyria* as Lord Kitchener had for destroying the tomb of a Sudanese Mahdi. This Roman policy no doubt explains the scarcity of identifiable martyrs' tombs; it also throws light on the circumstances under which relics of the martyr Trophimus of Pisidian Antioch, who suffered under the Emperor Probus (A.D. 276–282) were deposited in a reliquary coffer dug up near Synnada in 1907, and now in the Museum at Brussa. On the lid of this little marble box, shaped like a sarcophagus, is carved the legend: "Within are bones of Trophimus the Martyr. And whosoever shall ever cast out these bones, he shall have to reckon with God." It is obvious that this coffer was not intended for open exhibition; but it is inscribed with the very formula by which the early Christians of Phrygia, throughout the later third century, warned wrongdoers against interference with the graves of their dead. This formula, "he shall have to reckon with God"—or, as pagans read it, "with the god"—is exclusively Christian, and was in use by the Christians of Central Phrygia during the third century. The lettering of the inscription points to the same date, and the coffer, as Mendel (the first editor), Grégoire, and Ramsay have maintained against the late M. Duchesne, certainly belongs to the period of persecution, and is contemporary, or nearly contemporary, with the death of Trophimus. Trophimus is mentioned in the martyrologies, where the place of his martyrdom is given as Synnada. The dedication of a public tomb to a martyr was precarious; probably the fortunate discovery at Synnada illustrates a practice common during the persecutions, in spite of Roman vigilance.

A Third Laodicean Martyr

These considerations explain the curiously non-committal character of the following dedication of a martyr's tomb from the neighbourhood of Laodicea. It belongs to Suverek, which occupies the site of an ancient village (probably on the territory of Laodicea) which was raised to the rank of a bishopric (Psibela) at a later period. It was copied by Callander in 1904 and by Ramsay in 1906, in both cases without a complete version of the important third line. In 1910 I succeeded in reading this line completely; my copy was confirmed by Ramsay, and rests on our joint evidence.

The syntax of the inscription is irregular, and some

details are uncertain, but the general sense, which I translate as follows, is clear.[1]

> The tomb of Gennadius his father and lady mother
> constructed, for he grieved his family and native town,
> being a pastor over the sheep; for he endured (the prediction
> of) Holy Writ,
> dying most piteously, and among impious foes
> being gentle, and in years short-lived he came to his end.[2]

This is an epitaph—at first sight of an ordinary pagan type, belonging to the late third or early fourth century, and using the jerky and broken-winded hexameters common in this class of epitaph—dedicated to Gennadius by his unnamed father and mother. But when we look closely into it, we find features which distinguish it sharply from pagan epitaphs. The word "impious," applied to the "enemies" among whom Gennadius was so "gentle," reminds us at once of the language of the *Acts of the Martyrs*, in which similar expressions occur over and over again. This would of itself suggest that Gennadius was a Christian martyr; the third line, now fully recovered, places the question beyond doubt. In this line, "pastor over the sheep" describes the office of Gennadius in words which were consecrated in this sense from the first beginnings of Christianity, and the obscurely compendious "he endured Holy Writ," whatever the exact meaning we attach to the words, describes the conduct of a martyr who was steadfast to the end. The close association, in the Greek original, between these words and "dying most piteously" in the next line makes it clear that they refer to the martyrdom of Gennadius. They may mean either "He (did not deny) Holy Scripture, but endured (death)" or, more probably, as I have translated them, they are a condensed way of saying, "he endured the prediction of Holy Writ," in which case this south Galatian epitaph would contain a clear reference to the words addressed by Paul to the south Galatians in Acts xiv. 22, "exhorting them to continue in the faith, and that through many tribulations we must enter into the Kingdom of God," and to the south Galatian Timothy (2 Tim. iii. 12): "Yea, and all that would live godly in Christ Jesus shall suffer persecution." Such obscurity of expression is familiar to students of the epigraphy of pre-Constantinian Christianity. During the centuries before Christianity became a legal religion, the Christians had perforce to avoid open profession of their religion on tombstones, and had recourse to a veiled language. This obscurity of expression was both deliberate and necessary.

As regards the date of this inscription, I can feel no doubt that it belongs to the persecution under Maximinus II, which, as we have seen, weighed heavily on the Christians of Laodicea. The design of the panel, and the lettering, are similar to those on the sarcophagus of Julius Eugenius, although in this village epitaph the execution is not so careful. The sarcophagus of Eugenius was prepared about A.D. 340; the tombstone of Gennadius was dedicated a decade or two earlier, during the persecution or immediately after it. That it was contemporary with the persecution is clear from its veiled language; in the inscriptions of Eugenius and Severus, carved after the peace of the Church, Christianity is openly proclaimed. In the fourth century the ancient settlement at Suverek was probably a village on the territory of Laodicea; its inscriptions betray no trace of a separate city organisation. Gennadius was accordingly a presbyter, or at most a village bishop (*chor-episcopus*) under Bishop Severus of Laodicea. Eugenius survived his torture; Severus probably, and Gennadius certainly, "won the victor's crown." The Laodicean inscriptions thus remind the Church of three forgotten martyrs.

The Great Persecution in Phrygia

Neander, arguing from literary sources, and Ramsay, using the evidence of inscriptions, have both drawn the conclusion that Phrygia suffered but slightly in the persecutions antecedent to the great massacres under Decius and especially Diocletian and his associates (including the fierce persecutor Maximinus II, referred to by Bishop Eugenius). In the second and early third centuries persecution was usually instigated, and at times forced on an unwilling government, by the pagan population—or by the Jews; under Decius and Diocletian, it was engineered by the government itself. The picture of Phrygian society which the inscriptions enable us to reconstruct explains both the comparative lightness of persecution in the earlier period, and its severity in the later.

It is a picture, as Ramsay has pointed out, of accommodation and good feeling between the Christians and their pagan neighbours. On the negative side the orthodox Christians (I say "orthodox" because some of the heretical bodies form an exception) avoided all parade of their religion which would give offence to pagan susceptibility; on the positive side, they appear to have played an influential and patriotic part in the city life of the province. Under these conditions, the chief motive of the earlier type of persecution, popular ill-feeling against a body of men who were regarded in

[1] M. H. Grégoire, who very kindly read the paper referred to above at the Brussels Congress in my absence, differs from me in one or two points of detail, but accepts as certain my interpretation of this inscription as a martyr's epitaph.

[2] Τύμβον Γενναδείου πατὴρ καὶ πότνια μήτηρ
ἐξετέλεσσαν· ὁ γὰρ γένος πάτρην τ'ἀκάχησεν·
ποιμέν' ὄντ' ἐπ' ὄεσσιν· ὁ ἱρο[γ]ραφείην γὰρ ἀνέτλη
οἰκτιστον θνήσκων, καὶ δυσμένεων ἀνοσείων
ἤπιος ὤν, ἐταίων μινυνθάδειος δ' ἐτελεύτα.

The accusation at the beginning of l. 3 depends on the verb "adorned" or "buried," implied in the first sentence.

the Roman Empire generally as anti-social and unpatriotic, was largely absent in Phrygia; under these conditions, we can understand why the later type of persecution fell with especial fury on the Phrygian cities. Diocletian's policy was war on the Church as such; and good strategy demanded that he should attack the enemy in his strongest positions. It is clear that by the end of the third century many parts of Phrygia were almost solidly orthodox. Hence the severity of the Great Persecution in this area.

The Anti-Christian Associations

These are considerations of a general character. But there were special conditions in Phrygia, and especially in the rural districts of eastern Phrygia, which accentuated the severity of the persecution. In this area most of the land was in the private possession of the Roman Emperors, and the *coloni* or farmers on the Imperial Estates were united in associations whose bond of union was the worship of the God-Emperor. When the Emperor happened to be a Diocletian or a Maximinus, these associations lay ready to his hand as an instrument of persecution. Ramsay has in fact shown, on the evidence of the inscriptions of the Tekmoreian Brotherhood of the Estates near Pisidian Antioch, that there was an artificial and official revival of pagan worship on these Estates in the later third century, and has connected this revival with the anti-Christian propaganda organised by the Roman government. These Estates had, it seems, succeeded to the function of the Jewish synagogues of the second century, and had become, if not the sources, at least the media, of persecution. The Estates represented in the subscription-lists of the Tekmoreian Brotherhood at Antioch covered most of eastern Phrygia, and in the activity of this widespread and highly organised anti-Christian association we have doubtless a contributory cause of the severity of the persecution in this region. It is perhaps not without significance that Laodicea Combusta was itself close to an Imperial Estate, and inscriptions show that the bureau from which the Estate was managed was located in the city.

Montanism in the Persecution

A further consideration which must be borne in mind is the strength in Phrygia of a type of Christianity which actually courted persecution; and we may hazard the guess that many of the martyrs, both of the earlier and of the later period, represented this type. Phrygia was the home of Montanism; and an argument now in the press [1] will make it clear, I hope, that the peculiar north Phrygian tombstones, on which Christianity is openly professed, belonged to a Montanist community. The Montanists, as readers of Tertullian will remember, insisted on open profession of Christianity even at the risk of martyrdom. The argument that the north Phrygian "Christians to Christians" epitaphs are Montanist is reinforced by evidence from Lydia. Epiphanius, our principal authority on the early heresies, informs us that soon after the middle of the third century the Church of Thyatira was entirely Montanist, and a recently discovered third-century inscription from the neighbourhood of Thyatira makes open profession of Christianity. The inscriptions show that Laodicea Combusta was deeply affected by sectarianism in the later fourth century, chiefly of the Montanist-Novatian type; to this city belongs the unique distinction of having furnished a set of late fourth-century epitaphs mentioning Novatians, Cathari, Apotactites, Encratites, and Saccophori, the very sectarians regarding whose admission to the Church Amphilochius of Iconium consulted the great Basil of Cæsarea in A.D. 374. Epiphanius, writing in the same year, mentions a place which he calls "Phrygia the Burnt" as a nest of heresies and a centre of the Pisidian Encratites. The place he refers to, as I hope soon to prove elsewhere, is Laodicea the Burnt.

The Novatians and Encratites shared with the Montanists a stern attitude to those who "lapsed" in the persecutions, and communities of these sectarians must have presented a specially tempting target to the organisers of persecution.

The Fate of the "New Jerusalem"

I will close with a speculation. Eusebius and Lactantius both refer to a Christian town in Phrygia—neither gives its name—which was destroyed, with its whole population, in the Great Persecution. Eusebius adds the poignant detail that these Christians perished in the flames, "calling upon the God who is over all." Ramsay has published an ingenious argument identifying this town with Eumeneia or with Attanassus, whose inscriptions give evidence of a thriving Christianity throughout the third century, and suddenly cease at the end of it. But this is true (in a less marked degree) of other Phrygian towns. Moreover, Eumeneia and Attanassus were orthodox towns, and if an orthodox city had distinguished itself in this manner in the Great Persecution, it is unlikely that Eusebius at least would have withheld its name. The silence of Eusebius on this point, combined with the details which he gives of this frightful massacre, appear to me to point to a community of Montanist fanatics; and I would point out that Pepouza, in which a section of the Montanists awaited the Great Persecution and Descent of the New Jerusalem foretold in the Apocalypse, has in fact disappeared without leaving

[1] *Bulletin of the John Rylands Library, Manchester*, July 1923.

a trace. Can this be the true explanation of Epiphanius' reference to Pepouza: "The Montanists honour a deserted place in Phrygia, formerly a city called Pepouza, *but now levelled with the ground*, and they assert that the New Jerusalem descends there"? The heretic Aëtius, we know, was banished to Pepouza (if that is the correct form of "Petonsa" which we read in the text of Philostorgius) in A.D. 356, and it has been argued that this disproves the statement of Epiphanius. But may we not rather enjoy the grim humour displayed in the choice of a place of exile? The interesting detail recorded by Eusebius, that the Christians of the Phrygian town died "calling upon the God who is over all," is to be explained by reference to the prophecy of Joel, quoted in Acts ii. 17–21, "And it shall be in the last days . . . blood and fire and vapour of smoke . . . and it shall be, that *whosoever shall call on the name of the Lord* shall be saved." Such a reference suits the Montanists, whose faith was founded on the literalness of the prophecy in the Apocalypse, which foretold that a Great Persecution would precede the Second Advent. Neither Eusebius nor Epiphanius had any sympathy either with Montanism or with scientific history; between the lines of their narratives I am inclined to read the fate which befel the New Jerusalem of the Montanists in the Great Persecution.

Can a similar faith and a similar prejudice be invoked to explain why the Christain martyrs who are gradually being restored to History by the inscriptions of eastern Phrygia are unknown to the Calendar of the Church?

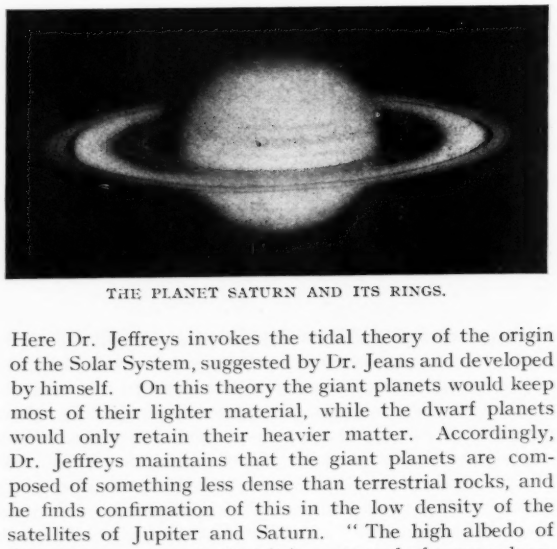
Among the Stars

A Monthly Commentary

The Giant Planets: A New Theory of their Constitution

As is well known even to those who have only a superficial knowledge of astronomy, the primary planets of the Solar System—exclusive of the asteroids—are divided into two groups which differ widely from each other. The four inner or dwarf planets are small, dense, mature bodies, while the four outer or giant planets are of great volume but comparatively small density. For the last half-century, indeed since Zöllner and Proctor showed that the clouds on Jupiter were in all probability raised by the intense internal heat of the planet, the opinion has prevailed that Jupiter, Saturn, Uranus, and Neptune are great inflated masses, partly gaseous, with very high internal temperatures. Despite much that is obscure and mysterious in regard to the giant planets, this view has been widely accepted, and has been on the whole satisfactory in explaining the markings both on Jupiter and Saturn. In a recent paper, however, Dr. Harold Jeffreys, who has made a special study of problems of cosmogony, challenges the prevailing theory and puts forward an alternative hypothesis. "The data," he states, "are more easily reconcilable with the hypothesis that these planets are cold and solid, their material being of low density in comparison with terrestrial rocks."

Dr. Jeffreys agrees with most astronomers in maintaining that in the case of each of the four outer planets, what we see is not the surface of a solid globe. This is proved by the fact that these planets do not rotate as rigid bodies; the rotation period is dependent on the latitude. What we actually observe is a cloud layer in the atmosphere at a height corresponding to that of terrestrial cumulus and strato-cumulus clouds. Nor does Dr. Jeffreys deny that the densities of the outer planets are very low. He joins issue with the accepted explanation of these facts—namely, that the planets are largely gaseous and intensely hot. "The low density affords as good an argument for the hypothesis that these planets are solid as against it. It compels us, however, to suppose that these planets are all composed of matter very different from the chief constituents of the Earth."



THE PLANET SATURN AND ITS RINGS.

Here Dr. Jeffreys invokes the tidal theory of the origin of the Solar System, suggested by Dr. Jeans and developed by himself. On this theory the giant planets would keep most of their lighter material, while the dwarf planets would only retain their heavier matter. Accordingly, Dr. Jeffreys maintains that the giant planets are composed of something less dense than terrestrial rocks, and he finds confirmation of this in the low density of the satellites of Jupiter and Saturn. "The high albedo of Saturn's ring suggests that it is composed of some colourless substance in a state of fine division, possibly ice or some other light non-metallic compound.

Dr. Jeffreys agrees that the atmospheres are very extensive, the depth being one-fifth of the radii of the planets. These atmospheres must be cold, and the suspended clouds in them "are probably composed of some material with much lower boiling and melting points than water." The hypothesis is a revolutionary one, and will probably meet with considerable opposition. It will undoubtedly have the effect of quickening interest in the giant planets and their nature.

The Nature of the Spiral Nebulæ

Professor Lindemann's hypothesis of the nature of

the spiral nebulæ—that they are composed of clouds of dust expelled from the galactic system by radiation-pressure and that they shine by reflected light—has been fruitful in provoking much discussion. Professor Perrine, the distinguished American astronomer who directs the Argentine National Observatory, has been working at the same problem and summarises his views in a recent article. There are several points of agreement between Professor Perrine and Professor Lindemann. According to both hypotheses the spirals have had their origin in dust-particles driven out of the galactic system by light-pressure. Dr. Lindemann, however, believes that the spirals shine by reflected light and are non-stellar, i.e. truly nebulous bodies; while Dr. Perrine maintains that these conclusions are quite untenable. "In one of these objects emission has been observed, and in at least one case known to me (N.G.C. 1,068) it is clearly established that both emission and absorption give the same radial velocity. This could not be the case if the absorption spectrum was due to reflected light." In the main, Professor Perrine holds, the spirals are composed of stars and the cosmical matter in them is merely incidental.

What, then, are the spirals? They are not external galaxies, but are "relatively small yet more or less autonomous sytems, comparable to the globular clusters, which for the most part have been ejected from our stellar system chiefly in the form of cosmical clouds by light-pressure." They have, however, now condensed to form stars, though nebulous matter is also present in them.

The great velocities indicate that they are beyond the gravitational control of our system, and are gradually becoming autonomous systems. "If the spirals," Dr. Perrine asks, "are so certainly finding their way into the great outer spaces, is it not logical to expect that there is something there for them to go to?" The bearing of this on Einstein's view of a finite universe is obvious. Also, one is tempted to ask, have we here the secret of the renewal of the universe? Will many of these comparatively small systems which we call the spirals come together and form a galaxy or galaxies similar to our own, which has, on Dr. Shapley's cosmogonic hypothesis, been formed by the union of many star-clusters? Dr. Perrine truly remarks that the study of the spirals "appears to be one of the most promising fields in the science."

The New Astronomer at the Cape

The post of His Majesty's Astronomer at the Cape, vacant by the death of Mr. Hough, has been filled by the appointment of Mr. Harold Spencer Jones, M.A., B.Sc., F.R.A.S., chief assistant at Greenwich Observatory. Mr. Jones, after a brilliant academic career, was appointed to his present post in 1913, and has been a prominent figure in the scientific world. Last year he was in charge of the Greenwich expedition to Christmas Island for the purpose of observing the total solar eclipse. Cloudy weather, however, prevented a view of the eclipse. Mr. Jones is a co-editor of *The Observatory* and author of an authoritative textbook on *General Astronomy*.

HECTOR MACPHERSON.

The Air Ministry and Atmospheric Problems

By R. J. V. Pulvertaft, B.A.

I. Testing a City's Air

LONDON, according to a French critic, is a town which is only inhabitable because the natives spend the summer in Scotland, the winter in the South of France, and the remaining months of the year in bed. The criticism is unkind, and Londoners can at least proudly boast of one of the world's lowest death-rates. A large city, with the resources of modern sanitation at its command, has advantages unknown to the Riviera or the Highlands. But even the most patriotic Londoner cannot feel altogether happy about the smoke and impure air which he is forced to breathe. Quite apart from fogs, with their constant sequel of illnesses and deaths due to chest complaints, the pollution of the atmosphere in towns has effects which are everywhere to be noticed.

For example, many moths, which in purer air wear a coat of modest grey, are forced in London to clothe themselves in funereal colours. The pepper-and-salt moth, within living memory, has almost disappeared, in its normal variety, from the London suburbs, and has been replaced by a completely black and much smaller variety, formerly rarely seen. The spring usher moth—a delicate insect which justifies its poetic name by emerging "before the swallow dares"—takes the winds of March with its beauty, nowadays, disguised on the oaks of Wimbledon Common in a cloak of deeply banded black. Again, the Elgin marbles, which saw many a century die in Greece without losing the white gleam of their marble, have acquired in London the prevailing dingy colour of their new land. The repairs of Westminster Abbey have largely been made necessary by the decay of its stone under the influence of the impure atmosphere.

> "They dreamt not of a perishable home
> Who thus could build"—

sang Wordsworth; and they built it, therefore, of a stone very perishable in the smoke-ridden air of which, also, they never dreamed.

We are getting better, it is true. London has not nearly as unlovely a sky as it had twenty years ago; gas and electric heating have made great improvements. Though London can never hope for the gleaming whiteness of towns such as Paris, Turin, or Alexandria, her atmosphere is brighter and cleaner than many other large towns and cities. The Advisory Committee of the Air Ministry has recently published a report on Atmospheric Pollution which contains

much interesting information on the subject. London, we learn, is in far better condition in this respect than is Rochdale, and the condition of Rochdale might be improved 30 per cent. if attention were paid to smoke-suppression measures within the power of local authorities.

Much ingenuity has been shown in devising apparatus to investigate atmospheric conditions. The air is drawn through a narrow jet, after passing through a damping chamber, and strikes against a microscope slide made of glass. When air passes through such a jet under pressure, and emerges on the other side, it is cooled—a fact of which advantage is taken in the manufacture of liquid air. The moisture which was taken up in the damping chamber condenses like dew on the particles of dust and smoke in the air, and these particles stick to the microscope slide, where they can be examined and analysed.

In a fog there are about 20,000 particles of dust in London air in every cubic centimetre; in dry, sunny weather by the seaside there are from 100 to 200. The composition of these dust-particles varies greatly. Oily matter, probably derived from tar, forms much of the impurity, and since such tar derivatives are, chemically speaking, very inert, they probably remain as permanent stains wherever they rest. We meet the same difficulty by many sea-coasts to-day, where the thick oils discarded from marine engines cover the pebbles with a sticky coat which time and tide seem only to increase in stickiness. Sometimes the air-dust is distinctly acid and, therefore, very destructive to stone and injurious to the lungs. There is a great deal of interesting reading in this little publication—ranging from comments on the probable meal-times of the inhabitants of Rochdale to the effect of industrial conditions on the purity of the air, and we trust that one result of the Committee's activities will be a renewed effort to suppress, as far as is possible, the undoubted evils of an impure atmosphere. Perhaps, before this generation has passed away, the pepper-and-salt moth may pay us the compliment of resuming its old garment of bucolic but more attractive grey.

II. Sunspots and Climate

The Air Ministry can certainly not be accused of a narrow outlook. We owe it to its Meteorological Office that the weather predictions, instead of possessing, as of old, the glorious uncertainty of cricket, have achieved a reliability almost as great as that of a billiards professional. The temperature of the upper air enables the weather prophet to interpret many signs which were formerly of uncertain import. But their activities do not end there, for at the same time as the appearance of their valuable report on Atmospheric Pollution, they have published a pamphlet on *Variations in the Levels of the Central African Lakes, Victoria and Albert.* These lakes, famous as the birthplace of the Nile, famous also in the annals of exploration and adventure, show a very strange harmony, it appears, with the mysterious spots on the sun's face which have been the subject of so much conjecture. Tables are given which appear to show that when the occurrence of spots on the sun's face is at a maximum, the levels of these lakes are lowest, and vice versa. This effect is attributed to the fact that the temperature in tropical lands is highest at "spot-maximum," and hence the evaporation on the lakes is greatest. Rainfall, of course, plays a large part in the determination of the level of the lakes; but on occasions variations from the normal level have been noted to a marked degree without any corresponding change in the rainfall, and in these cases the association with sun-spots is remarkable. These observations are of great interest; on the state of affairs in these central lakes depends, to some extent at least, the prosperity of Egypt, the success of the cotton crop, and, therefore, the conditions of the cotton industry in Lancashire.

Opinion is very keenly divided on the question of the influence of sun-spots on climate. In a recent number of DISCOVERY there appeared a review of a work which sought to uphold the view that they had a great influence[1]; and certain correspondents made it plain that their opinions were of an opposite nature. This latest piece of information on the subject may well be commended to their notice.

Reviews of Books

A SOLDIER'S CONTRIBUTION TO MESOPOTAMIAN ARCHÆOLOGY

Babylonian Problems. By LIEUT.-COLONEL W. H. LANE, Indian Army (retired). With an Introduction by PROFESSOR S. LANGDON. With maps and illustrations. (John Murray, 21*s.*)

"The principal scientific contribution of this book," says Professor Langdon in his introduction, "consists in new and dependable topographical information on the region between Samarra and Tell-Abir. These new maps and the description of the region given in the text constitute the best topographical information which has ever been placed at the disposal of scholars." He adds that the book "will never out-live its scientific value." Praise such as this from so eminent and critical a scholar as Professor Langdon leaves a reviewer with but little to say.

The chief problem with which Colonel Lane is concerned, and around which to a great extent centre the investiga-

[1] *Sunspots and Climate*, by Dr. A. S. Russell. DISCOVERY, March 1923.

tions described in his volume, is the topography of the ancient city of Opis, which is identified with the ruins at Tell-Abir, situated opposite the present junction of the River Adhaim with the Tigris. This location was suggested as long ago as 1841 by John Ross and Lieutenant H. Blosse-Lynch; but its acceptance by later scholars has been delayed by a difficulty in reconciling it with an inscription of Nebuchadnezzar. This difficulty a translation suggested by Professor Langdon has overcome, and the site of Opis, on which so many Babylonian problems hinge, may now be regarded as established.

Opis is the most important ancient city on the Tigris, and was founded by the Sumerians at least before 3500 B.C. It is suggested that the original name was Akshak, though Professor Langdon admits that this identification will probably give rise to criticism. At the time of the Cassite incursion into Mesopotamia it becomes U-pi-e. It possessed a cult of a deity of the lower world—a cult which Professor Langdon points out is as old as the prehistoric Elamite period of Sumerian history. It is mentioned for the last time by Strabo in 24 B.C. This gives it an existence as a thriving city of 3,500 years. Throughout this period mention of it in inscriptions and in historical records is frequent.

Colonel Lane's topographical researches make plain the reasons for its prolonged importance. As a military and irrigation centre, it was the Key of Accad and Babylon. The author claims to have located the site of Nimrod's Dam, which controlled the waters of the Tigris, and the point at which the Median Wall, constructed by Nebuchadnezzar, joined that river. With its strongly organised defensive system of canals, Opis constituted one flank of the line of defence which extended to the Euphrates, or, as he aims at showing, to Sippar. Limits of space preclude a more detailed examination here of Colonel Lane's investigations at Opis; but when, as must inevitably happen at some future date, excavations are undertaken on this important site, his work will prove invaluable in indicating the points at which investigation will prove most fruitful and the nature of the problems which it may be expected to elucidate.

Of the other matters with which the author deals, fascinating as they are, a brief mention must suffice. He discusses the question of the size and system of defence of ancient Babylon and, if he offers no solution of the controversial question of its area, he does at least suggest the line upon which the investigation of the archæologist's spade must work to afford a satisfactory answer. He also follows in the footsteps of Xenophon and his band of ten thousand Greeks in their march from the "Gates" to the battlefield of Cunaxa and in the retreat thence to Opis, offering suggestions as to the location of the two former which seem reasonably probable in their agreement with the requirements of the narrative. One of the most arresting chapters in the book, however, is his detailed elucidation of the campaign of Julian the Apostate which, after the death in battle of that Emperor, led to the disastrous defeat and capitulation of the army and lost the Eastern Empire to Rome.

E. N. FALLAIZE.

SCIENTIFIC BOOKS

The British Journal of Experimental Biology. Vol. I, No. 1. Managing Editor, F. A. E. CREW. (Edinburgh: Oliver & Boyd, 12*s.* 6*d.* quarterly.)

This latest addition to the list of learned journals should fulfil a very useful function. It is designed to cover the whole field of experimental biology. At present there is far too sharp a dividing-line between the problems of the human body, and the problems which those whose interest is mainly directed towards other forms of life have to solve. It is becoming increasingly evident that all life is essentially the same, subject to the same laws, manifesting itself by similar mechanism. This first volume contains, for example, an article by L. T. Hogben and F. A. E. Crew which serves to show how a difficult question can be decided by the use of a living creature as a kind of chemical reagent, and in this case at least without the slightest inconvenience to that creature. There were really two problems: firstly, during what month of the development of the internal secreting glands of sheep and oxen before birth do they become active? Secondly, there is a well-known monstrous calf frequently born to cows of the Dexter breed. Can this monster be compared—as has been done—to that rather rare type of human imbecile known as a cretin? The problems are really very similar, because a cretin is a child in whom the thyroid gland is inactive—and one of the marvellous medical advances of our age has been the curing of such children with thyroid gland taken by the mouth.

The problem was solved with the help of an axolotl—a creature whose history is as strange as its name. Many will recognise it as a South American amphibian, allied to our English newt, which, like Peter Pan, refuses to grow up, and breeds in its tadpole stage, under water. But if it be given active thyroid gland to eat, it develops into a lizard-like creature which lives on land. The important fact is that even the smallest amount of active gland is sufficient to make it grow up completely—it is a kind of trigger action. By using this knowledge it was discovered that the thyroid gland is not active until the fourth month of development, and that the thyroid gland of the Dexter calf monster is fully active at birth; it is not, therefore, a kind of bovine cretin. From the point of view of medical science the important fact emerges that it is possible to distinguish active from inactive thyroid gland microscopically.

Another gland—the pituitary, a small body at the base of the skull which sometimes is responsible for the occurrence of human giants—was examined by a similar method. In this case a frog was used as a test animal. The frog possesses in a lesser degree the power which we associate with chameleons of changing its colour on occasions, by the extension or retraction of special pigment-bearing cells. The injection of extract of pituitary gland makes all these cells extend—the least possible quantity turning a pale yellow frog to a coal-black one in less than an hour. It appears that the pituitary gland begins activity before the thyroid.

Other articles include a study by H. B. Fell of a case of sex reversal in a domestic fowl—a previously orthodox

hen, laying its due quota of eggs, became a cock as related by Dr. F. A. E. Crew; several intermediate conditions of sex are described, with a microscopical study of the fowls' organs; a critical summary of the marvellous work being done in the culture of living structures of the body in an artificial medium by H. M. Carleton; and an article by Julian Huxley on the basis of heredity.

The list of names on the editorial board is a sure promise that the high standard of this interesting and important number will be maintained.

Cancer: A Word of Hope. By REDDIE MALLETT. (Watts & Co., 1s.)

The only word of hope which this work is likely to bring is to the proprietors of a strange assortment of interests, mentioned in the text and advertised on the back page. They include a property in Devon, to which sufferers are recommended to go (apply, among others, to Reddie Mallett); a new bread, invented by the author, sole proprietors X. Y. Z.; and a prepared lemon-juice. Numerous other money-making concerns are mentioned in the course of a book which reminds us of nothing except those lists of recipes sent gratis by the proprietors of foods and flavourings, each containing a reference to their own preparations as an inevitable ingredient. It cannot be too often repeated that all nations of the world suffer from cancer, and that every variety of dietary—from vegetarianism to a pure flesh diet—is somewhere to be found. The main tenet of this pamphlet—that in diet is the cure for this scourge—is not upheld by the experience of any qualified observer; our own opinion of its object we leave to the author's intelligence.

The Advancement of Science, 1923. Addresses delivered at the Ninety-first Annual Meeting of the British Association for the Advancement of Science. (John Murray, 6s.)

In this volume are collected the reports of fourteen leaders of thought and research in all the branches of modern science, dealing each with one problem of present-day interest and importance. An account has already been given in these pages of the meeting, and many will doubtless be glad to possess this convenient record for further study. While those portions of the volume which deal with the atom may prove difficult reading to the general public, the greater part is devoted to subjects within the grasp of the inexpert.

Makers of Science—Mathematics, Physics, and Astronomy. By IVOR B. HART. (Oxford University Press, 6s.)

As a combination of biography with instruction this book is a complete success. Amply illustrated, and written in a most clear and readable style, it would seem an admirable book to introduce into the higher forms of schools, on the "Classical" as well as on the "Modern" side.

Handbook of Physiology. By W. D. HALLIBURTON, M.D., LL.D., F.R.C.P., F.R.S. 16th Edition. (John Murray, 21s.)

The fact that a book has gone through sixteen editions is a proof that it must have rare and remarkable features. But when we know that this book is in fact the 29th edition of Kirkes' *Physiology*, although it has changed beyond recognition in the course of years, we must realise that we have here that rarest of scientific works—a book trustworthy in every respect as a record of modern knowledge, yet capable of adaptation and expansion as new learning renders it necessary. This latest edition includes portraits of the great men in the history of Physiology, and has been expanded in several respects to bring it more fully up to date. If a student is to be confined to one textbook of physiology, this is undoubtedly the one which he should—and does—select.

A Manual of Histology. By V. H. MOTTRAM, M.A., Professor of Physiology in the University of London. (Methuen, 14s.)

A most welcome book. The study of the microscopical appearance of the tissues of the body is often a difficult part of the medical student's training, but it is perhaps one of the most essential. The excellent drawings really look like the structures which the student will himself see; there is nothing about what others with better eyes or imaginations claim to have seen. A few misprints have crept in—e.g. "storma" for "stroma" on page 144. But the text as a whole is commendably clear, particularly in its account of the difficult Central Nervous System. We should like to see more space devoted to the preparation and staining of sections; only the simpler staining methods are given, but these are well described, and are amply sufficient for the normal medical course. We confidently expect that this manual will meet with success. R. J. V. P.

Elementary Zoology. By OSWALD H. LATTER. (London: Methuen & Co., Ltd., 12s. net.)

We cannot help feeling rather sorry that Mr. Latter has written this book. He is such a master of natural history, and has such skill in presenting his knowledge of the living animal, that we feel he is wasting his talent on anatomy, even though in this textbook it is made more palatable by a modicum of physiology and natural history.

The publishers claim that the book covers the syllabus in Zoology prescribed by the University of London and the Northern Universities Joint Board for those about to matriculate. This subject forms but one of the five or six that are required. If the other subjects can only be "covered" by books of the same size and standard as Latter's *Zoology*, we think that the Society for the Prevention of Cruelty to Children really ought to intervene.

We have in this book all the minute detail which has turned Zoology into a matter of memory and not of thought and principle. Every appendage of the Crayfish has every joint named, and the unhappy beginner, not being able to distinguish between what is essential and what is not essential, struggles with such monstrosities as "dactylopodite" and "scaphognathite." Anyone who wants to know the structure, say, of the second walking leg, can surely look it up without having to learn it.

The book covers 330-odd pages, some of them containing as many as 325 words. It would make a useful

if somewhat dry textbook for the earlier part of an Honours Course in any University; but we fear it will rather "put the beginner off." Anything more terrifying than Fig. 8, a diagrammatic plan of the view of the human skull, could hardly be imagined. The illustrations are numerous and, on the whole, good; but some of them are very diagrammatic. One merit the book certainly has, and that is its moderate cost.

A. E. SHIPLEY.

MISCELLANEOUS BOOKS

An Introduction to the History of England, 1815–1880. By C. R. L. FLETCHER. (John Murray, 3*s.* 6*d.*)

Dr. Fletcher makes so engaging an apology for writing—to wit, the pleasure of scribbling—that we are straightway heartened to face with him the tortuous political history of the years 1815–1880.

Though he declares of Sir Charles Schuster and the Rev. Henry Johnson, who read the book in typescript, that "each is equally anxious to disclaim any responsibility for the opinions of the writer," we cannot believe that many people would find fault with the following statement of his estimate of the whole period: "The ideal history of the last hundred years would be one in which Simpson and Faraday would be of more account than Peel, Darwin and Kelvin than Gladstone or Disraeli." Indeed, the belief in the unimportance of the politician is the popular view in most circles to-day; there is even a danger of too great a reaction in this direction. It may be forgotten that though the statesman would do well to draw a moral from the story of King Canute and realise his impotence over the tide of progress, he is nevertheless capable of an important discretion in the building of piers and houses.

But although there is so little danger that the importance of the modern statesman will be over-estimated, we still have an exaggerated reverence for the "Great Reformers" and the "Victorian Statesmen." Most of us have been so frankly bored by the period that we were only too willing to admire all the reformers and their reforms vaguely and leave it at that. Dr. Fletcher does succeed in disentangling the various personalities and presenting them fairly to us as human beings. He even dissipates the atmosphere of irritated awe with which some men regard the Pope by such casual remarks as, "the Pope, who, poor man, had recently consoled himself for the loss of his last temporal possession, the city of Rome, by declaring himself infallible."

Dr. Fletcher has taken the period in considerable detail, covering some four hundred and seventy pages, and possibly the student who makes his first acquaintance with the period may find such detail confusing. But those who have even the vaguest knowledge of the personalities with whom he deals should find the book of real interest. It is almost a duty at the moment to become familiar with the years that followed the Napoleonic wars. While we may have but little admiration for the scrambling reforms into which the statesmen of the period were forced by the facts of social progress, we cannot but sympathise with their post-war difficulties. "If you take a file of any newspaper to-day and compare it with a file of *The Times* of those years, you will see much the same sort of remedies for present discontents—including a repudiation of the National Debt." The analogy between the position of Germany to-day and France then is too close not to have a lesson for us in dealing with the problem of Reparations. Then as now England was at some pains to urge the practical advantages of making a defeated enemy work as against the barren joy of sitting on the said enemy's head. Further, "the position of Russia was not unlike America, 1918–19; she had come comparatively late and unwilling into the war of which Britain and Austria had for many years borne the brunt; but the accidents of her geography and her climate enabled her to ruin Napoleon." Her advantageous position further enabled her with England to force reasonable terms for France from the other Allies. The trade revival made possible by this settlement is an excellent illustration of the fact that the quality of mercy "blesseth him that gives and him that takes."

It remains to be seen whether the present League of Nations will meet the fate of that "sort of League of Nations," the Holy Alliance. There is room for hope in the fact that science has made a more intimate knowledge and understanding of our neighbours possible. Further, the scientific mind and subsequent attitude towards life is daily becoming more common, and as the author says: "An entire devotion to any branch of Natural Science probably leads to the happiest life of which a man is capable. . . . In the pure and rarefied atmosphere which they breathe the horrors of politics pass unheeded, the zeal for discovery swallows up the lust for fame, and little room is left for personal, and none for international, jealousy."

E. L. M. P.

Below the Snow Line. By DOUGLAS W. FRESHFIELD, D.C.L. (Constable & Co., Ltd.)

A former president of the Alpine Club and Royal Geographical Society and a mountaineer in the Caucasus, Italian Alps, and Himalayas, describes with much colour and erudition climbs and adventurous wanderings in the Maritime Alps, Corsica, the Apennines, North Africa, and elsewhere.

The Elephant Man and Other Reminiscences. By SIR FREDERICK TREVES. (Cassell, 7*s.* 6*d.*)

This book may please lovers of abnormal and morbid subjects. It struck the reviewer as neither a work of art nor as a piece of entertaining reading.

A Fairy-tale of the Sea. By MACLEOD YEARSLEY. (Watts & Co., 3*s.* 6*d.*)

This is an attractive little book which may amuse and instruct (a little) the very young. Just the thing to while away a wet day at the seaside or a too hot day when even paddling palls, and nothing but a "story," with head in shade and feet in a pool, can pacify the day's fretfulness.

The author should realise, however, that italics in excess reveal the prentice hand; and that a too colloquial

style, even in children's and fishes' conversations, is not the best. And it seems a pity that what is meant for children should not be of the best, in however humble a sphere.

Miss Alice Woodward is to be congratulated on her illustrations; they are clear and charming, and, drawn with a characteristic humour, must add considerably to the value of the book in grown-up eyes as well as in those of the younger generation for whom it was intended.

Books Received

(Mention in this column does not preclude a review.)

The Wonders of the Stars. By JOSEPH MCCABE. (Watts & Co., 3*s.*)

The A B C of Atoms. By BERTRAND RUSSELL. (Kegan Paul, 4*s.* 6*d.*)

Botany. A Junior Book for Schools. By R. H. YAPP (Cambridge University Press, 3*s.* 6*d.*)

Roman Britain. By R. G. COLLINGWOOD, F.S.A. (Oxford University Press, 2*s.* 6*d.*)

Indian Bird Life. By M. R. N. HOLMER. (Oxford University Press, 3*s.* 6*d.*)

Elementary Mathematical Astronomy. By C. W. C. BARLOW, M.A., B.Sc.; and G. H. BRYAN, D.Sc., M.A., F.R.S. (University Tutorial Press, 9*s.* 6*d.*)

Elementary Hygiene. By BIHARI LAL BHATIA and PREM NATH SURI. (Longmans, Green & Co., 2*s.* 6*d.*)

Animal Parasites and Human Disease. By ASA C. CHANDLER, M.S., Ph.D. (Chapman & Hall, Ltd., 22*s.*)

The New Physics. By ARTHUR HAAS. (Methuen, 6*s.*)

Makers of Science. By IVOR B. HART. (Oxford University Press, 6*s.*)

The Kingdom of the Heavens: Some Star Secrets. By CHARLES NORDMANN. Translated by E. E. FOURNIER D'ALBE. (Fisher Unwin, 12*s.* 6*d.*)

Variations in the Levels of the Central African Lakes Victoria and Albert. By C. E. P. BROOKS, M.Sc. (Published by the Meteorological Committee, 1*s.* 6*d.*)

The Subject Index to Periodicals, 1920. F, Education and Child Welfare. (Issued by the Library Association. Published by the Library Association; agents: Messrs. Grafton & Co., 4*s.*)

Probité Scientifique. Par MAURICE LECAT. Chez l'Auteur, Louvain.

Sul Principio delle Energie di Moto e Sulle sur Consequenze. ING. GAETANO IVALOI. (Societa Editrice Libraria, Milano.)

The New Natural History. Being the Twenty-fifth Robert Boyle Lecture. By PROFESSOR J. ARTHUR THOMSON, M.A., LL.D. (Humphrey Milford, 1*s.*)

Seventy-seventh Annual Report of the Director of the Astronomical Observatory of Harvard College for the Year ending September 30, 1922. By HARLOW SHAPLEY. (Published by the University, Cambridge, Massachusetts.)

On the Form of the Distribution Law of Stellar Velocities. Reprint 2. By WILLEM J. LUYTEN. Reprinted from the *Proceedings of the National Academy of Sciences.*

Report on Observations in the Year ending March 31, 1922. By the Meteorological Office Air Ministry Advisory Committee on Atmospheric Pollution. (His Majesty's Stationery Office, 3*s.*)

Essai son la Cause de la Gravitation. Par N. SAKELLAROPOULO. (Le Caire.)

Local Geology. A Guide to Sources of Information. By A. MORLEY DAVIES, D.Sc., F.R.G.S., F.G.S. (Thomas Murby & Co., 1*s.*)

Origins in Place-names. II, Sound; III, Growth. By AN IGNORANT STUDENT. (Privately printed at the Chiswick Press.)

A Manual of Practical Dactylography. A Work for the Use of Students of the Finger-print Method of Identification. By DR. HENRY FAULDS, F.R.Anthrop.I., etc. (*Police Review* Publishing Co., 2*s.*; cloth, 3*s.*)

Some Primitive Stone Implements from Uganda. By REGINALD A. SMITH, B.A., F.S.A. With an Introduction by E. J. WAYLAND, A.R.C.Sc., F.G.S., M.I.M.M. Occasional Paper No. 1 issued by the Geological Survey of Uganda, Entebbe. (Government Press, Uganda.)

The Universal Law of Organic Progress. By DANIEL NELSON CLARK, LL.B. (Ingersall & Harrison, Los Angeles, California, 15 cents.)

The University of Liverpool Tidal Institute's Fourth Annual Report, 1923.

The British Journal of Experimental Biology. Vol. I, No. 1, October 1923. (Edinburgh: Oliver & Boyd, Quarterly, 12*s.* 6*d.*)

The Advancement of Science. Addresses delivered at the Ninety-first Annual Meeting of the British Association for the Advancement of Science. (John Murray, 6*s.*)

Harrap's New World Atlas in Contour Colourings. Edited by JOHN BARTHOLOMEW, F.R.G.S. (George G. Harrap & Co., Ltd., 1*s.*)

Guide to Dairying in South Africa. By R. BROUGHAM COOK. (Basil Blackwell, 15*s.*)

Recent Developments of the Atomic Theory. By LEO GRAETZ. Translated by GUY BARR. (Methuen, 9*s.*)

Earth and Sun. By ELLSWORTH HUNTINGDON. With a chapter by H. HELM CLAYTON. (Humphrey Milford, 28*s.*)

The Origin of Magic and Religion. By W. J. PERRY. Methuen, 6*s.*)

The Botany Gardens of the James Allen's Girls' School, Dulwich. By LILIAN J. CLARKE, D.Sc., F.L.S. (His Majesty's Stationery Office.)

ERRATUM

Theories and Problems of Cancer, by C. E. WALKER, D.Sc., M.R.C.S., L.R.C.P., is published by the University Press of Liverpool, Ltd., and Hodder & Stoughton, Ltd., price 5*s.*

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